

Contraceptive continuation among women aged 15-49 utilising
City of Cape Town family planning services.

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Dedication

This study is dedicated in loving memory of my father, Derek Deveraj Naidoo (1959-2018), for his unfailing belief in me, his constant love and support and his emphatic belief in social justice.

*We little knew that day,
God was going to call your name.
In life we loved you dearly,
In death, we do the same.*

*It broke our hearts to lose you.
You did not go alone.
For part of us went with you,
The day God called you home.*

*You left us beautiful memories,
Your love is still our guide.
And although we cannot see you,
You are always at our side.*

*Our family chain is broken,
And nothing seems the same,
But as God calls us one by one,
The chain will link again.*

Author: Ron Tranmer

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List of Abbreviations

ART- Anti Retroviral Treatment

AGYW- Adolescent Girls and Young Women

CCT- City of Cape Town

CHEC- Centre for Higher Education Consortium

DHS- Demographic and Health Surveys

DMPA-IM- Depo Medroxyprogesterone Acetate (intramuscular)

ECP- Emergency Contraceptive Pills

HIV- Human Immunodeficiency Virus

IUCD- Intrauterine Contraceptive Device

LARC- Long-Acting Reversible Methods

NET-EN- Norethisterone Enanthate

OCP- Oral Contraceptive Pills

PREHMIS- Patient Record and Health Management Information System

RedCap- Research Electronic Data Capture

SA- South Africa

SAM- Short-Acting Methods

STI- Sexually Transmitted Infections

SSA- Sub-Saharan Africa

TB- Tuberculosis

UCT- University of Cape Town

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Part A: Protocol

Contraceptive continuation among women aged 15-49 utilising City of Cape
Town family planning services.

Research Protocol for Master of Public Health
(General Public Health Track)

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Introduction

Contraception & HIV risk

Contraceptive continuation can be defined as the continual use of a contraceptive method/s without cessation of use for any reason while still at risk of a pregnancy (Castle & Askew, 2015:2). In South Africa (SA), the contraceptive prevalence rate (percentage of women who use any contraceptive method) is moderate at 48% with 99% of users using a modern contraceptive method (Department of Health, 2019: 97). However, contraceptive continuation among users is estimated to be lower. In SA, contraceptive continuation among all methods is estimated at 40.4% to 85.3% (Baumgartner et al., 2012, Beksinska, M.E. & Rees, 2001, Beksinska, M.E., Rees & Smit, 2001, Hofmeyr, G Justus. et al., 2016, Smit & Beksinska, 2013). Sexually active SA women also have an unmet need for contraception of 19%, which contraceptive discontinuation contributes to (Department of Health, 2019:93). Discontinuation can lead to unintended and mistimed pregnancies, which can have several negative maternal, infant and child health outcomes. Unintended and mistimed pregnancies have been identified as contributors to the transmission of HIV from mother to child. They also play a role in increasing the demand for abortions and can result in miscarriages and stillbirths. Moreover, these pregnancies contribute to elevated rates of maternal morbidity and mortality (Ali, Mohammed. M, Cleland & Shah, 2012, Barden-O'Fallon et al., 2011, Castle & Askew, 2015, Crede et al., 2012). Furthermore, contraceptive discontinuation impedes the impact of reproductive health programmes aimed at improving women's health and managing fertility.

The main contraceptive methods used among women in SA are injectable contraceptives Depo-Medroxyprogesterone acetate Intramuscular (DMPA-IM) and Norethisterone Enanthate (NET-EN) and oral contraceptive pills (OCPs). The use of injectable contraceptives (DMPA-IM and NET-EN) nationally is estimated to be over 49%, and up to 90% in some provinces (Department of Health, 2012:19). However, injectable contraception has been found to have lower rates of continuation and a 6% failure rate with typical use (Trussell, 2011:399), which may leave women at increased risk of unintended and mistimed pregnancies. Women also suffer a disproportionately high burden of HIV. Adolescent girls and young women (AGYW) are at an increased risk of new infection, with females aged 15-19-years-old having the highest incidence of HIV in the general population. Overall, 7% of young women and men aged 15-24 are HIV positive. HIV prevalence is four times higher among young women than young men (12% versus 3%) (Department of Health, 2019:223). Previously, there has been some concern over an increased risk of HIV-1 acquisition with the use of hormonal contraceptives such as DMPA-IM (Hapgood, Kaushic & Hel, 2018, Morrison et al.,2015). However, WHO guidelines have been updated following the Evidence for Contraceptive Options and HIV Outcomes (ECHO) trial to show no increased risk when using any hormonal methods (ECHO, 2019: 303).

This study therefore aims to examine patterns of contraceptive use among users of injectable contraceptives (DMPA-IM and NET-EN), OCPs, subdermal implants, IUCDs, male and female condoms and emergency contraceptive pills (ECP) over a one-year period to determine factors associated with contraceptive continuation and use.

Background

In South Africa, 55% of in-union women and 60% of sexually active women are currently using a method of contraception (Department of Health, 2019: 93). However, its use is estimated to be limited to a few methods, with the highest usage noted for injectable contraceptives at 25% (Department of Health, 2019:93). Within the population, contraceptive continuation is estimated to be low. On average, 38% of women discontinue contraceptive method use by the end of 12 months (Castle & Askew, 2015:2). Women discontinue use for various reasons, but most often due to method related side effects or dissatisfaction with their chosen method. There are also higher rates of continuation with the use of long-acting reversible contraception (LARCs) as they require a healthcare professional to remove, whereas short acting methods require greater adherence and contact with the healthcare system. Method choice is often limited by health systems factors such as, healthcare provider bias, but can also be influenced by potential drug interactions with TB medication. Contraceptive discontinuation can have detrimental health and social impacts such as unintended and mistimed pregnancies and its associated effects.

Contraceptive use

In sub-Saharan Africa (SSA), modern contraceptive use is estimated at 40%, with the highest usage levels of 83% in Southern Africa (Darroch & Singh, 2013:1758). In South Africa, contraceptive prevalence is estimated at 48% (Department of Health, 2019:93). Despite the high usage of contraceptives in SA, many challenges remain in the uptake and use of contraceptives among women and particularly AGYW who have higher rates of unintended pregnancy (Lince-Deroche et al., 2016:97). Furthermore, this prevalence rate is still lower than other upper middle-income countries, such as Brazil (79.5%), Mexico (72.1%) and Russia (78.6%) (Lince-Deroche et al., 2016:97). In addition, discontinuation exacerbates this problem (Barden-O'Fallon et al., 2011:3), as SA women have an unmet need for contraception of 19% (Department of Health, 2019: 93). However, lower usage rates and unmet need are only part of the issue, as among those who are considered contraceptive users, discontinuation, method breaks and switching of methods are common, particularly, among injectable users (Smit & Beksinska, 2013:363). In a recent study, it was found that contraception use was also lower in key groups, such as black African and younger women who tended to use mostly injectable contraceptives and OCPs (Chersich et al., 2017:1). Nationally, there also remains a focus on the use of injectable and oral contraceptives, as opposed to LARCs which is a trend mirrored in SSA (Chersich et al., 2017:307).

Therefore, even with high usage rates, there remains issues of unintended and mistimed pregnancies among those using contraceptives.

Factors reported in the literature known to be associated with contraceptive use are complex and exist within the context of HIV & TB in South Africa. A lower household income, level of education and knowledge about conception processes and contraceptive choices negatively influences the uptake of contraception (Department of Health, 2019: 95). The associated side effects and women's perceptions of different methods may also influence women to stop method use (Castle & Askew, 2015:1). In addition, the health system, including service quality and the service environment as well as healthcare provider attitudes and knowledge can also have a large impact on contraceptive uptake (Castle & Askew, 2015:1, Chersich et al., 2017:309).

Contraceptive continuation

Contraceptive continuation can be defined as continual contraceptive use without stopping for any reason while still at risk of an unintended pregnancy (Castle & Askew, 2015:3). This includes the continued use of contraceptive methods without a 'break' or premature discontinuation, as well as having timely and a correct number of repeat contraceptives as specified by the method guidelines. For example, this would include receiving repeat injections on time, taking an oral contraceptive pill (OCP) every day, replacing an intrauterine contraceptive device (IUCD) and subdermal implant in the specified time, and using a condom at coital interactions.

Evidence from 60 demographic and health surveys illustrates that approximately one third (38%) of women stop using a modern contraceptive method by the first year and approximately half (55%) before the end of two years (Ali, Mohammed. M, Cleland & Shah, 2012:11), with the highest drop off after the first cycle (Baumgartner et al., 2012:66). In South Africa, contraceptive continuation is estimated to be between 13% and 85.3% across contraceptive methods (Baumgartner et al., 2012, Beksinska, M.E. & Rees, 2001, Beksinska, M.E., Rees & Smit, 2001, Department of Health, 2019, Hofmeyr, G Justus. et al., 2016, Smit & Beksinska, 2013). An unpublished internal study conducted by the City of Cape Town (CCT) at Ikhwezi clinic, a high client volume site, found that only 19% of all women who used DMPA-IM had the required number of repeat injections in a 6-month period and 19% of women aged 15-24 (AGYW) had the required number of repeat injections in the same period. In addition, 6% of all women using NET-EN had the required number of repeat injections in a 6-month period, while 7% of AGYW had the required number of repeat injections in a 6-month period (Lee, personal communication, 2017, Jan 23). Within the SA context however, high rates of discontinuation may often be due to transient relationships, and so one needs to factor in unmet need. If a woman is not in a relationship and is not sexually active, she does not have unmet need. In SA marriage and cohabitation rates are very low, which is different from other sub-Saharan African countries (Posel & Rutwick., 2013,

Odimegwu et al., 2018), Statistics South Africa.,2020). Women may not see partners for long periods of time and therefore, women may discontinue due to side effects, if they are not currently sexually active. A minority of women (6-11%) who discontinue a method do so due to a desire to become pregnant (Ali,Mohammed. M, Cleland & Shah, 2012:12). Most women therefore discontinue method use for reasons other than a desire for pregnancy. Of these women, many discontinue their method without switching to another method or consulting a healthcare professional (Castle & Askew, 2015:2).

Reasons for discontinuation & possible interventions

Women discontinue contraceptive method use for different reasons related to their health and well-being, their knowledge of how methods work, and which methods are available, method failure and dissatisfaction with their method and due to health system factors, such as limited method choice and insufficient counselling. Overall, women who are younger, of higher parity, and are unmarried or not in union, are the most likely to discontinue a method (Barden-O'Fallon et al., 2011:13). It is essential to promote informed choice within a rights-based, patient-centred framework, so women have methods which suit them personally. This can often mean method switching, which must be easily facilitated through the health system to reduce discontinuation.

Side effects

The main reasons women discontinue contraceptive use is due to side effects and method dissatisfaction (Ali, Mohammed. M, Cleland & Shah, 2012:6). These are generally related to a change in bleeding patterns (Baumgartner et al., 2012:66), amenorrhea, abdominal cramping, weight gain, (Mrwebi et al., 2018:160) headaches, dizziness, and vaginal discharge (Beksinska, M.E. & Rees, 2001:309). Women's perceptions of side effects and how they impact their daily lives is a key factor, as some side effects can be easily managed. Expanding the method-mix available to women is important to give them more choices, potentially with less side effects, considering menstrual disturbances are often the most frequently cited reason for discontinuation (Beksinska, M.E., Rees & Smit, 2001:309).

Method failure and dissatisfaction

In addition, method failure is also cited as a reason for discontinuation but can often be attributed to incorrect and inconsistent method use, which is higher in OCP and condom users (Trussell, 2011:2). A study conducted in the U.S. found that almost half of all unintended pregnancies occurred because of incorrect or inconsistent contraceptive use (Frost & Darroch, 2008:94). The study concluded that women who were not completely satisfied with their method choice were more likely to use contraceptives inconsistently, with only one in ten pregnancies due to method failure (Frost & Darroch, 2008:94). Method dissatisfaction also contributes to switching or stopping use altogether and is one of the main reasons for discontinuation in women.

Unintentional discontinuation

Unintentional discontinuation is another contributing factor to lower method continuation and is common for those who use injectable contraceptives. A study conducted in the Eastern and Western Cape provinces found that 29%-42% of injectable users were up to two weeks late for their re-supply and a further 16-25% arrived two to twelve weeks late (Baumgartner et al., 2007:66). Similarly, a study conducted in Malawi found that 51% of new injectable users had their follow up injection within 13 weeks and only 15% adhered to the method (Dasgupta, Zaba & Crampin, 2015:145). Often clients will be denied a re-injection when they come late for their method repeat as they fall outside of the 'grace' period, which contributes to discontinuation of method use and often causes 'method breaks or temporary discontinuation, which leave women vulnerable to unintended pregnancy (Baumgartner et al., 2012:305).

Knowledge and information

A lack of knowledge on available methods may leave women with the perception of limited choice and influence discontinuation or a lower uptake of contraception. LARCs are very effective contraceptive methods, however, use and knowledge of LARCs are poor. In a study conducted in East London, Mrwebi et al. found that despite women on average having a positive attitude toward the subdermal implant, 81% of participants were unsure of whether the implant caused permanent infertility and 95% were unaware of its inability to prevent STIs (2018:160). A further 19% of women in the study had opted to use the subdermal implant due to a prior unintended pregnancy or a termination of pregnancy. The implant has been in use since 2014 but despite this, rates of utilisation are low, with premature discontinuation (Mrwebi et al., 2018:160). Furthermore, a lack of knowledge of how methods work may contribute to high failure rates and discontinuation in certain methods. Baumgartner, et al. found that many women were unaware that they were at risk of pregnancy if they did not come for reinjection within the stipulated period, and some thought they were protected if they did not have their menses (2012:308). Women also tend to have a limited knowledge of available methods, with high usage of injectable contraceptives (up to 90% in some areas of South Africa).

Poor levels of knowledge inform misconceptions around different contraceptive methods and may also influence method continuation, as women may not receive adequate or user-friendly counselling on side effects and how contraceptives work. In a study conducted in the Western and Eastern Cape across 12 primary healthcare facilities, approximately 26% of women had heard of the IUCD and of those, about 9% had misconceptions about the device, such as the ability of the device to move to another part of the body or cause infertility, which negatively influenced their views of the device (Gutin et al., 2011:145). Providers also felt that they did not have adequate training and information on this device to be able to communicate to clients (Gutin et al., 2011:145). Sufficient knowledge of contraceptive methods is

pivotal to acceptance of contraceptive method use and should be provided for, in contraceptive counselling (Mrwebi et al., 2018:163). When adequate counselling on side effects were tested among women in the Gambia and Niger, women were more likely to continue (Cotten et al., 1992).

Health systems factors

The service environment and the quality of care received can have a large impact on method continuation, especially regarding the quality of contraceptive counselling which is offered. Users need informed counselling which gives them a choice based on their personal needs. Other factors which can influence this is the method mix of contraceptive choices available to women, stock-outs of methods, provider bias and low technical competence, lack of client privacy and confidentiality, how services are clustered and the overall family planning service environment (Castle & Askew, 2015:3). For example, in a study conducted by Baumgartner et al. unintentional discontinuation of injectable contraceptives decreased when provider job aids were made available to healthcare workers as women were not turned away for re-injection services (2012:305). Health systems factors can also influence partner involvement in contraceptive choice and continuation, depending on whether the services are welcoming of partners or not (Castle & Askew, 2015:3).

Role of healthcare providers

Healthcare providers play a critical role in women's method continuation or discontinuation. Contraceptive method use is often provider driven and can often be influenced by provider bias and perceptions about which methods are acceptable for different groups (Pleaner et al., 2017:934). Additionally, health care provider recommendations and method convenience were found to be the most common influences of method choice in women (Crede et al., 2012:2). For example, Clark et al. argues that only 43% of clinicians prescribed LARCs as first choice contraceptives for post-partum adolescents, despite its recommendation as a safe and reversible method for immediate use (2018: S17). Method choice is often limited by provider attitudes and practices, particularly by primary health care nurses (Department of Health, 2012:25). Therefore, high quality contraceptive counselling is necessary in South Africa and should involve choice driven counselling within a sexual and reproductive health and rights-based framework (Pleaner et al., 2017:934). Fundamentally, informed counselling is about giving women an informed choice based on their personal needs, delivered in a format they understand.

Contraceptive method discontinuation may be associated with several factors, including low motivation to avoid pregnancy, pregnancy ambivalence, method dissatisfaction, side effects (Frost & Darroch, 2008:95), younger age, higher parity, lower socio-economic status, (Barden-O'Fallon et al., 2011:12) method failure, lower education level and lower partner communication (Ali, Mohammed. M, Cleland & Shah, 2012:11), HIV status, and drug interactions. These represent significantly associated factors for discontinuation of contraceptive methods and can also influence method switching. Essentially,

contraceptive continuation needs to be increased and easier method switching needs to be facilitated over the reproductive cycle.

Method switching

Method choice is important for contraceptive continuation as short acting methods (such as injectables, condoms and oral pills) have lower adherence due to the need for more frequent method repeats and interactions with health facilities and providers. Within this, contraceptive method switching is an important part of ensuring contraceptive continuation if pregnancy is not desired.

Many authors agree that there is a greater need for informed contraceptive counselling to limit discontinuation and or facilitate method switching (Beksinska, M. E. et al., 1998: 20, Van Bogaert, 2003: 861, Westaway, Chabalala & Viljoen, 1997: 1552). Westaway et al found that 42% of women in their study discontinued contraception rather than switching methods, due to side effects (1997: 1552). This is a general problem as it was found that between 4%-20% of women who do not switch methods within three months of discontinuation, had a pregnancy, with the remaining women at risk of a pregnancy (Ali, Mohammed. M, Cleland & Shah, 2012, Bradley, Schwandt & Khan, 2009). In general, for those women who do switch methods after discontinuation of their previous method, most of them use a modern method (Castle & Askew, 2015: 5). However, not all women switch to a modern or an effective method after discontinuation, about 10% of women, switch to condoms (Castle & Askew, 2015: 5). It was found that on average, women who have a higher socio-economic status and a higher level of education, as well as those who do not desire any more children are more likely to switch to another modern reversible method (Ali, Mohamed M, Park & Ngo, 2014:47). Switching between other hormonal methods are common, for example between oral pills and the injectable (Ali, Mohammed. M, Cleland & Shah, 2012: 11-12). Among those women who generally switched to traditional methods from a modern method, they reported doing so due to concerns with their hormonal method (Ali, Mohammed.M, Cleland & Shah, 2012:10).

Method switching behaviour has changed over time in South Africa. A study conducted by Hofmeyr et al. notes a rate of switching as low as 11.9% (1995: 21), while more recent studies undertaken in SA have noted higher levels and more frequent switching (Smit & Beksinska, 2013: 363). This may be indicative of a greater method mix becoming available in the public sector and women switching to find more personally preferable methods. In the South African setting, where high rates of method switching, method breaks, and discontinuation occur particularly among injectable users switching between the two injectable methods, this makes measurement of evidence on the potential increased risks between DMPA-IM and HIV-1 transmission difficult (Smit & Beksinska, 2013:363).

Women should be provided with a range of contraceptive choices and adequate information and counselling, particularly on method side effects upfront to make an informed choice to ensure

continuation of contraception or method switching as opposed to discontinuation, if they do not desire fertility.

Discontinuation rates by method

The South African public health sector has increased its contraceptive method-mix over the last decade. Methods available to women include DMPA-IM and NET-EN, OCPs, emergency contraceptive pills, male and female condoms, IUCDs, subdermal implants (Implanon NXT) and male and female sterilization. Method provision at facilities, however, are dependent on trained providers and method stock. The 2016 SADHS reported a 29% all method discontinuation rate for methods available in the public sector (Department of Health, 2019:97).

Injectable contraceptives and oral contraceptive pills

Contraceptive continuation varies by contraceptive method, with higher discontinuation occurring in short acting methods. In particular, the injectable contraceptive-DMPA-IM has the highest level of discontinuation and lower levels of adherence (Ali, Mohammed. M, Cleland & Shah, 2012:10). Despite this, the use of short acting hormonal contraceptives is highly prevalent in SSA as well as South Africa (Chersich et al., 2017:307). A study conducted in Durban, found contraceptive continuation rates to be 40.4% after one year for DMPA-IM, 64.4% for NET-EN and 64.6% for the OCP, with method switching and ‘method breaks’ also common (Smit & Beksinska, 2013:363-364). A two-year cohort study conducted in Johannesburg found continuation rates of DMPA-IM and NET-EN of 42% after 1 year and 21% after 2 years, with method switching and temporary discontinuation also frequent among women (Beksinska, M.E., Rees & Smit, 2001:309). Within the SA context however, high rates of discontinuation may often be due to transient relationships, and so one needs to factor in unmet need. If a woman is not in a relationship and is not sexually active, she does not have unmet need. In SA marriage and cohabitation rates are very low, which is different from other sub-Saharan African countries. Women may not see partners so long periods of time and therefore, women may discontinue due to side effects, if they are not currently sexually active.

Condoms and dual protection

Condoms are considered a coitus specific contraceptive method and has the largest gap between typical (incorrect and inconsistent use) and perfect use (correct and consistent use) pregnancy rates (Clark et al., 2018: S17). Condoms also have high failure rates with typical use (male condom 18%, female condom 21%) (Trussell, 2011:398). As per South Africa’s national policy guidelines, male condoms are a core contraceptive method and are available in all public sector facilities, however, use as a primary contraceptive method is much lower (Beksinska, M.E., Smit & Mantell, 2012:2). In an SA study, male condom use was recorded at 12% among sexually active women (Beksinska, M.E., Smit & Mantell,

2012:4). However, SA national data has male condom use at 16% and female condom use at 0.1% (Department of Health, 2019:103). South Africa is a high HIV prevalence setting, with one third of young women infected with HIV and two-thirds at risk of infection, and as such dual method use (use of a modern non-barrier method combined with condoms) are encouraged for protection against pregnancy as well as sexually transmitted infections and diseases (Department of Health, 2019:94). However, dual method use among women aged 15-49 is estimated to be low, at approximately 10% (Morrone, Tibazarwa & Myer, 2006:620). The dominant source of obtaining male condoms is from clinics or community health centres (51%, however, private sources such as shops (26% and pharmacies (12%) are also used. This would make measurement of dual use more difficult (Department of Health, 2019: 96).

IUCD

The IUCD is a highly effective LARC method, on par with tubal ligation, a permanent family planning method (Hanekom & Van der Westhuizen, 2016:42). It also has better continuation rates than short-acting methods (Kluge & Steyn, 2010:21) and has the longest duration of continuation of all methods (Ali, Mohammed. M, Cleland & Shah, 2012:10). However, it has low utilisation rates with 2% usage reported for the copper IUCD (Rees et al., 2017:939). A study conducted at a community health centre (CHC) in Pietermaritzburg reported usage in their sample to be 2.7% (Builu & Naidoo, 2015:27) with similarly low rates reported in other studies in South Africa (Hanekom & Van der Westhuizen, 2016:42, Hofmeyr, G Justus. et al., 2016). In a randomised controlled trial conducted in South Africa, IUCD discontinuation rates were 16.5% at 20 months of follow up in the sample and were mainly attributed to side effects, such as abdominal pain and backache (Hofmeyr, G Justus. et al., 2016:4). A meta-analysis reported similar continuation rates of approximately 74% among users (Diedrich, Klein & Peipert, 2017:364).

Subdermal implant

The implant is another LARC method which is also highly effective in preventing pregnancy. In South Africa, Implanon NXT is available in the public sector. Implant use is recorded at 13% nationally (Department of Health, 2019: 94) but represents a decline since its introduction in 2014 (Pleaner et al., 2017:934). In the US, contraceptive continuation rates for the implant are estimated to be about 80% over 1-year (Diedrich, Klein & Peipert, 2017:364). However, a study conducted in Gauteng and the North-West province found that healthcare providers had a negative attitude toward the subdermal implant because they lacked confidence and training in providing this service (Adeagbo et al., 2017:822). Furthermore, declines were noted in insertions from the 2014/15 period from 175 000 to only 50 000 in the 2016/17 period (Rees, et al.,2017: 939). The implant is no longer considered a new method in South Africa and as such, use has been on the rise. However, the implant, along with the

IUCD still has low overall usage in South Africa, of about 4% in sexually active users (Department of health, 2019: 95). Both IUCDs and implants require minimal contact with healthcare providers which may influence continuation positively (Clark et al., 2018: S18).

Impact of contraceptive discontinuation

Contraceptive continuation is a key aspect of preventing unintended and mistimed pregnancies which can lead to a host of adverse maternal, infant and child health outcomes (Barden-O'fallon et al., 2011:12). High failure and discontinuation rates, 'method breaks and low adherence to contraceptive methods can lead to unintended and mistimed pregnancies. Within the South African context however, high rates of discontinuation may often be due to transient relationships, and so one needs to factor in unmet need. If a woman is not in a relationship and is not sexually active, she does not have unmet need.

Unintended pregnancy

Globally, approximately 33 million unintended pregnancies occur among women using both traditional family planning (withdrawal, calendar, temperature, cervical mucous and lactational amenorrhoea methods) and modern contraceptive methods (injectable contraceptives, OCPs, patch, ring implants and IUCDs) (Ali, Mohammed. M, Cleland & Shah, 2012:6). Low contraceptive continuation is a contributing factor to the reduced impact of reproductive health programmes designed to prevent unintended pregnancy (Castle & Askew, 2015:1). Low contraceptive method continuation can also lead to an increased need for abortions, poor obstetric and child health outcomes and higher maternal mortality and morbidity (Ali, Mohammed. M, Cleland & Shah, 2012:6). In addition, unintended pregnancy can have adverse reproductive consequences, such as miscarriage and stillbirths (Ali, Mohammed. M, Cleland & Shah, 2012:6). To this end, Ali et al., report that between 5%-20% of unplanned pregnancies result in either miscarriage, stillbirths, or abortion (2012:6). In low-and middle-income settings, up to half of all unintended pregnancies end in abortion, contributing to high maternal mortality and morbidity through unsafe or illegal abortions (Castle & Askew, 2015:1). The provision of contraception and its correct and consistent use contributes to a reduction of mistimed and unintended pregnancies, HIV infection, maternal mortality, and poor obstetric outcomes (Crede et al., 2012:1). The prevention of unintended and mistimed pregnancy is also a key aspect of preventing mother to child transmission of HIV, which is disproportionately high in SSA (Iyun et al., 2018:1).

HIV and hormon). Few users continued with the method through-out the period **al contraceptives**

The Western Cape has an HIV prevalence of 12.4% among women of reproductive age (Poolman, Van der Walt & Luwaca, 2017:8). Previously, this added further complexity to contraceptive choice, as some studies found that hormonal contraceptives, mainly DMPA-IM, may be associated with an increased

risk of HIV-1 acquisition (Hapgood, Kaushic & Hel, 2018, Morrison et al., 2015). Clear evidence on this issue was further complicated by high discontinuation, switching and method breaks occurring among women (Smit & Beksinska, 2013:363). However, the most recent evidence from the ECHO trial shows that there is no evidence of increased risk of HIV with the use of DMPA-IM, implants or copper IUDs and women should be encouraged to use their preferred method (ECHO, 2019:303), to ensure continuation of any method or method switching to provide pregnancy protection, particularly in AGYW. Due to the high levels of HIV in SA as well as high levels of risk in the AGYW group, counselling and method choice does need to consider issues related to risk and prevention (Department of Health, 2012: 2).

Drug interactions with hormonal contraception is a further issue of concern, especially in terms of possible TB drug interactions with contraceptive methods as there are high burdens of these diseases in the population. National policy advice influences the provision of contraceptives to certain groups. For example, for HIV positive women using the antiretroviral drug (ARV) efavirenz, it was recommended that they are not prescribed the implant. Furthermore, hormonal contraceptives may be less effective among TB patients as TB drug regimens may alter contraceptive drug metabolism, resulting in insufficient drug levels and an increased risk of pregnancy. However, the evidence is mixed, with some studies showing no increased risk of pregnancy (Simmons et al, 2018: 804). SA national contraceptive policy is clear about not prescribing combined hormonal contraceptives (combined oral pill, injectables, patches and vaginal rings) to women on the tuberculosis drugs, rifampicin or rifabutin (Department of Health, 2012: 25).

HIV/AIDS and maternal deaths remain the leading cause of death in women of reproductive age globally, and most of these deaths are preventable. AGYW are disproportionately affected by the HIV epidemic and remain a key subgroup for women's reproductive health (Department of health, 2019: 96). A key strategy to decrease maternal and child deaths, reduce the vertical transmission of HIV and improve reproductive health in regions of high HIV prevalence, is through universal access to reproductive health services (Patel, 2014: 644).

Methodological approaches and measurement of contraceptive continuation in existing studies

The measurement of contraceptive continuation, which refers to the consistent use of a chosen contraceptive method over a specified period, is important for evaluating family planning programs and understanding contraceptive behaviours. Several methodological approaches are employed in research and surveys to capture contraceptive continuation. These approaches include calendar-based methods, prospective data collection, clinic or pharmacy records, surveys, and demographic health surveys (DHS), contraceptive calendars or diaries, and contraceptive event analysis. These methods vary in their

reliance on self-reporting, objective measures, recall periods, and statistical techniques. Studies by (Bradley and Croft.,2012, Blanc and Curtis.,2009, Polis et al.,2019, Ross and Hardee.,2013, WHO., 2016) provide insights into these methodological approaches and their application in measuring contraceptive continuation. Therefore, there are several ways to measure continuation and measurement would depend on the study design and available data. This inevitably causes methodological challenges around comparing studies directly. But it does offer the researcher the opportunity to measure continuation in various ways, depending on the data available and setting.

Gaps in the literature

The need for more qualitative and mixed-methods research to gain deeper insights into the experiences and perspectives of South African women regarding contraceptive continuation is important, as well as understanding what discontinuation and ambivalence means to users. In addition, there is limited research on perspectives of men and the role of male engagement within this, signifying the importance of exploring intersectionality of various factors influencing continuation. Exploring contraceptive use dynamics among women who started or restarted using contraception during the postpartum period is another important area. By identifying gaps in the literature, this review aims to inform future research efforts and contribute to the development of targeted interventions to improve contraceptive continuation rates in South Africa.

CONCLUSION

Despite the widespread availability of contraceptives, its cost-free provision in the public sector and its relatively high uptake, women still experience high rates of unintended (53%) and unwanted (17%) pregnancies (Baumgartner et al., 2007:67). Contraceptive discontinuation is compounded by high injectable contraceptive use across the country, which also poses a potential risk of HIV-1 acquisition. Furthermore, low contraceptive continuation reduces contraceptive efficacy as a tool to improve women's health (Baumgartner et al., 2007:67).

PURPOSE OF THE STUDY

There is a paucity of studies conducted on contraceptive continuation in SA. Furthermore, no previous study has looked at all modern methods available in the public sector in Cape Town and what their continuation proportions are. The study aims to fill this knowledge gap through examining contraceptive continuation and use with associated factors among female users of modern contraceptives accessing contraceptive services at CCT primary health facilities, with the aim of improving service provision and training.

STUDY SETTING

The study will be conducted throughout the Cape metropolitan region, which consists of eight sub-districts which serve the health needs of the population. They are, Eastern, Northern, Southern, Western, Klipfontein, Khayelitsha, Mitchells Plain and Tygerberg. Currently the CCT is providing contraceptives in 102 primary facilities. The study will therefore include all facilities administered by the CCT and offering contraceptives including satellite and mobile clinics, which are made up of urban, peri-urban, and suburban facilities across Cape Town (see appendix 3 for a list of all facilities which will be included). These types of facilities are the most common providers of contraceptives in South Africa, providing contraceptives to approximately 80% of all users nationally, 11% from the private sector and 8% from other sources (Department of Health, 2019: 93-96). All facilities provide family planning appointments and a mix of different contraceptive methods depending on method stock and provider training. The methods available are oral contraceptive pills (progesterone only and combined), emergency contraceptive pills, subdermal implant (Implanon), IUCD (copper), injectables-DMPA-IM and NET-EN, male and female condoms and male and female sterilization. Contraceptive services are offered in different packages, however, there is high usage of injectable contraceptives. In an unpublished study conducted by the CCT at Ikhwezi primary clinic between October 2016 and March 2017, it was reported that among adolescents (aged 15-19), 3% were using OCPs, 27% were using DMPA-IM, 69% were using NET-EN, while 0% used IUCDs and 1% used sub-dermal implants. Among young women (aged 20-24), 9% used OCPs, 60% used DMPA-IM, 29% used NET-EN, 0% used IUCDs, while only 1% used the subdermal implant (Lee, personal communication, 2017, Jan 23). In addition, the HIV prevalence in the Western Cape region is estimated at 12.4% among women of reproductive age, which is relatively high. While contraceptive usage was estimated at 54% by a recent national study (Chersich et al., 2017:310)

AIMS AND OBJECTIVES

The primary aim of this study is to estimate contraceptive continuation (coverage) and identify demographic and health factors associated with continuation among female contraceptive users aged 15-49 at 102 primary health facilities provided by the CCT. The secondary aim of this study is to examine the types of contraceptive methods used by women and demographic and health characteristics associated with each method, between 01 January to 31 December 2017.

The objectives of the study are to:

1. Describe the demographic characteristics of women utilising City of Cape Town contraceptive services.
2. Describe the types of contraceptive methods used by women.

3. Establish overall and method specific contraceptive continuation.
4. Identify factors associated with first-method contraceptive continuation among users.
5. Identify factors associated with all-method contraceptive continuation among users.
6. Cross-check routine contraceptive services data.

METHODOLOGY

Study Design

The proposed study will utilise a descriptive cross-sectional design. The study will utilize routinely collected data obtained from the Patient Record and Health Management Information System (PREHMIS). PREHMIS is an electronic record system maintained by the CCT that captures services rendered at all CCT health facilities (see appendix 1 for a list of captured services). All health facilities (excluding male clinics) provide family planning services which consists of a family planning consultation and access to the following services: male and female condoms, oral pill cycles; DMPA-IM and NET-EN injections, subdermal implant insertions and removals, emergency contraception, IUCD insertions, and pregnancy tests. The scope of this study will be to focus on users of injectable contraceptives, IUCDs, implants, oral pills, condoms, and emergency contraception to explore usage patterns and associated demographic (age, marital status, language, location of site) and health factors (HIV status, TB status, contraceptive method, had a pregnancy in 12 months). As users enter the study in 2017, the first method used, is considered the baseline method, and that method is measured for continuation and/or switching. Male and female sterilization will not be included in this study as it is not offered in CCT primary facilities, (see Appendix2).

This study will also cross-check routine contraceptive service data. A dataset for the procurement of contraceptives for the CCT over the same period (January-December 2017) will be analysed to see the procurement of contraceptives corresponds to contraceptive service volumes dispensed for each contraceptive method and overall. As well as by type of facility, low, medium, and high volume.

Using clinic contraceptive data to establish contraceptive continuation fills a crucial gap in the existing literature. While previous studies have examined contraceptive usage patterns and characteristics of contraceptive users, the specific focus on continuation rates using clinic data provides valuable insights into the real-world effectiveness and sustainability of contraceptive methods. This approach allows researchers to directly assess the actual continuation of contraceptive methods among users in a clinical setting, providing more accurate and representative information compared to self-reported data or survey-based studies. By analyzing a large dataset from 102 public sector clinics in Cape Town, South Africa, this study can offer a comprehensive understanding of contraceptive continuation in a diverse population accessing public health services. The findings can contribute to identifying factors

influencing contraceptive discontinuation, assessing the effectiveness of different contraceptive methods, and informing strategies to improve continuation rates and reduce unintended pregnancies. Overall, using clinic contraceptive data to establish contraceptive continuation addresses a critical knowledge gap at low cost and enhances our understanding of contraceptive behavior in a real-world context.

Study Population

Data from approximately 250 000 women aged 15-49 years accessing contraceptive services will be included in the sample amounting to approximately 500 000-600 000 contraceptive encounters, in the period 01 January to 31 December 2017. According to 2017 census data, there are 1 125 622 women of reproductive age in the city of Cape Town (Department of Health, 2017). Approximately 80% of all modern contraceptive users obtain their methods from the public sector. (Department of Health, 2019: 93). In CapeTown, approximately 60% of these women receive their contraceptive services from the CCT and about 40% from provincial facilities.

Eligibility, Recruitment and Enrolment

All women of reproductive age (15-49) who accessed any contraceptive service at a primary healthcare facility provided by the CCT between 01 January to 31 December 2017 will be included as participants in the study as their reproductive appointments form part of routine data collection.

Inclusion criteria:

- Women aged 15-49 years between 01 January to 31 December 2017.
- Accessed any contraceptive service at a CCT primary healthcare facility.

Exclusion criteria:

- All women who did not access a contraceptive service in the period 01 January to 31 December 2017.
- All women under the age of 15 (definition of reproductive age).
- All women over the age of 49 (definition of reproductive age).

Data Safety and Monitoring Plan

Data capturing and management took place at all study sites through routine data capturing and management processes conducted by the CCT. This data will be abstracted by a CCT employee in an excel format from the back end of the PREHMIS system. The CCT will share the data electronically in a password protected excel sheet. This data will then be exported into the secure 28-bit encrypted

research electronic data capture (REDCap) system. Data will be cleaned, organised, and stored in this system for a period of five years, before being discarded. The second dataset (for the validation study) will also be shared electronically in a password protected excel sheet and will be destroyed upon study completion (this dataset will not contain any individual patient data however).

STATISTICAL ANALYSES

Data will be analysed in three stages (univariate, bivariate and multivariable) using the Stata statistical package STATA version 15.0 (Stata Corporation, College Station, Texas).

Descriptive analysis

Characteristics of the study population will be summarized using medians and (interquartile range (IQR)) or means and standard deviations depending on data distribution. Categorical variables will be expressed as proportions (percentages).

For this analysis, first method contraceptive continuation will be defined as not stopping the use of a current method in the 12-month period (IUCD and implant) or having the required amount of method repeats in a 12-month period (injectable contraceptives, OCPs) which amounts to complete or incomplete contraceptive coverage over the 12-month period (please see appendix two for definition of contraceptive terms). All-method contraceptive continuation will be defined as remaining on a baseline method through-out the period for long-acting methods and having the required amount of method repeats in the period (adherence) for short-acting methods or switching to a new method after cessation of a previous method (excluding condoms). As well as returning to the same method after a 'break' in use.

First method continuation can generally lend some inference to a method's suitability and popularity among participants. While all-method continuation can give us more of a picture of continuation and therefore pregnancy protection in the sample over time as participants may use many methods in the period in trying to find a personally suitable method. They may also tailor their methods to their changing personal circumstances.

This variable will be dichotomized into a binary variable for method continuation or non-continuation over a 12-month period (See appendix 4 for definition of continuation by method). The analysis will explore demographic characteristics such as: age, geographic location of site where services were accessed (8 sub-districts), language, marital status and health characteristics such as HIV status, TB status, pregnancy in 12 months, type of contraceptive method used (DMPA-IM, NET-EN, OCP, implant, IUCD) combined condom and modern method use (dual method use), LARC method use (IUCD, implant), short acting method use (OCP, injectables, condoms) and method switching.

Chi square analyses will be conducted to examine whether a relationship exists, and univariate logistic regression models will be fitted to investigate whether contraceptive method continuation and method type are associated with demographic and health characteristics, as well as determine the unadjusted odds ratio with 95% confidence intervals.

Multivariate models

Multivariate logistic regression models will be fitted to assess the association of demographic and health characteristics with contraceptive continuation. The models will also determine the adjusted odds ratio with 95% confidence intervals. A significance level of $p < 0.05$ will be set.

DATA CROSS-CHECKING

This study will also validate routinely collected contraceptive service data by comparing procurement data for each contraceptive method against contraceptive method procurement data per facility. One high, medium, and low volume clinic will be sampled from each of the 8 health sub-Districts (specific sites and the period of analysis will be negotiated with the CCT). This verification study will be done to establish the validity of contraceptive continuation and method usage proportions obtained from the data through examining if procurement volumes are the same as service volumes for each method and overall.

DESCRIPTION OF RISKS AND BENEFITS

Potential risks and benefits

This study consists of the secondary analysis of existing routinely collected health services data through a record review. The researcher will not have direct access to the PREHMIS system and will receive a de-identified spreadsheet of the requested data. This raw data will be stored on an encrypted system (REDCAP) and as such poses only minimal risk to participants. The second dataset will not contain any individual patient information. Findings from this study will inform and improve training strategies, and the curriculum for induction of new staff at CCT. It also has the potential to improve service quality and provision and may inform strategies to manage fertility. This research will also fill a gap in an under-researched area and contribute to the knowledge base through a published study.

INFORMED CONSENT PROCESS

This study forms part of a collaboration between the University of Cape Town (UCT) and the CCT under a joint research programme with the centre for higher education consortium (CHEC) and CCT

for the attainment of quality research through improved partnerships, and as such is fully supported by CCT. Informed consent will not be sought from participants as their appointments form part of routinely collected health services data and this study will be a secondary analysis of that data, involving no direct interaction with human subjects. In addition, the study will contain more than 250 000 women, as such it is not feasible to obtain informed consent.

PRIVACY AND CONFIDENTIALITY

To protect participant privacy, the researcher will not have direct access to the PREHMIS system and will receive a de-identified spreadsheet of the requested data. This raw data will be imported into REDcap and only two researchers will have access to it. The primary researcher will also work on a password protected computer. The research data will be discarded from the REDcap system after five years and the primary researcher will discard both sets of study data upon study completion. In addition, no clinic identifier will be disclosed in any publication emanating from the study.

Post research

The researcher will feedback to the CCT health services through a written report, and oral presentations at fora determined by the CCT and through the publication of the study in a peer reviewed journal.

RESOURCES

Funding

This study is funded through the CHEC and CCT 2017/18 research programme under the thematic area “youth at risk”. The funding covers the thesis course fee of the primary researcher (student). There are no additional research costs.

LOGISTICS

This is a record review of existing routinely collected data and will therefore not result in any additional research costs.

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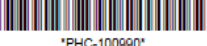



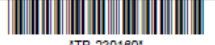



















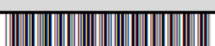
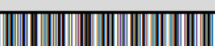










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APPENDIX ONE: PREHMIS INPUT SHEET

Table 1: City of Cape Town PREHMIS routine monthly report (RMR) input sheet for an adult

Place Sticker Here	DATE					PREHMIS RMR Input Sheet for		DATE		
						Adult				
							Folder Drawn			
				ART Visit Capture from ART record				HCT Visit Capture from Consent form		
Other services rendered but not recorded on this form									TB	
Curative Service						Patient screened positive for TB symptoms				
	Reproductive Health					Patient screened negative for TB symptoms				
Oral pill cycle (Packets issued)		/	/	/	/	TB Presumptive Patient Category (w/Non Presumptive, R/R+R/R+ Presumptive, DR+Drug Resistant Presumptive)				/
Medroxyprogesterone injection						TB Presumptive patient Sputum Sample				/
Norethisterone enanthate injection						DOTS Visit - Facility				
IUCD inserted								Drug Management		
Etonogestrel (subdermal) Implant						Medication collected on behalf of patient - Line items dispensed				/
Etonogestrel (subdermal) Removal (SR = self request, AE = adverse effects, TR = technique related, PRG = pregnant, EXP = expired)		/	/	/	/	Medication collected by patient - Line items dispensed				/
Emergency contraception						CDU issued: C = Complete (as is), I = Incomplete (items added / changed)				/
Female condoms issued		/	/	/	/	Patients treated (Diffucan tablets - donated stock): OC = Oesophageal Candidiasis, CM = Cryptococcal Meningitis				/
All cervical smears (R=Routine, D=Diagnostic)		/	/	/	/	Number of Diflucan tablets (donated stock) issued				/
Pregnancy Test (Pos/Neg)		/	/	/	/			Nutrition		
	STI					Nutrition Visit				
STI treated - new episode		/	/	/	/			IPT		/
Male Urethritis Syndrome treated - new episode						Initiated on TB preventive therapy:(AoART, AnART, CDS, CDR)				/
Male condoms distributed						TB preventive medication collected-no. months collected				/
Medical male circumcision performed						TST test result (P=Pos/N=Neg)				/
Adverse male circumcision events						TB preventive therapy outcome:(OO, AE, LTF, TFO, COM, SRX, RIP)				/

APPENDIX TWO: DEFINITION OF TERMS

Table 2: City of Cape Town definition of terms

Method	Dispensed	Repeat	Failure rates
Oral pill cycle	28 days.	(up to three months can be given but facilities are advised to give a one month supply due to stock-outs).	Typical use: 9% Perfect use: 0.3%
Depo-Medroxyprogesterone injectables	12 weeks.	repeat may be given up to two weeks early or four weeks late.	Typical use: 6% Perfect use: 0.2%
Norethisterone enanthate Injectables	eight weeks.	repeat may be given up to two weeks early or two weeks late.	Typical use: 6% Perfect use: 0.2%
IUCD	Immediately.	ten years.	Typical use: 0.2% Perfect use: 0.2%
Emergency contraceptive pill	Up to five days after unprotected sex.	Up to five days after unprotected sex.	58-95% effective depending on how early it is taken (Trussell, 2011).
Etonogestrel (subdermal) implant	“If no contraceptive method was used previously, insertion should be during days one - five of the cycle. If the woman was previously on a combined hormonal method including the pill, patch or ring, insertion should occur during the hormone-free week. If the woman is using a progesterone-only contraceptive insertion can occur at any time. When using the injectable contraceptive or IUCD, insertion occurs when the next injected dose or device insertion is due” (Patel, 2014:645).	three years.	Typical use: 0.05% Perfect use: 0.05%
Male condoms	Anytime (one or more pack of ten).	Anytime (one or more pack of ten).	Typical use: 18% Perfect use: 2%
Female condoms	Anytime (one or more pack of ten).	Anytime (one or more pack of ten).	Typical use: 21% Perfect use: 5%

APPENDIX THREE: CLINICS

Table 3: City of Cape Town: health sub-districts and clinics

Clinic name	Clinic name
Cape Town Eastern Health sub-District	
Blue Downs Clinic	Ikhwezi CDC
Dr Ivan Toms CDC	Kuilsriver Clinic
Driftsands Satellite Clinic	Sarepta Clinic
Eerste River Clinic	Sir Lowry's Pass CDC
Fagan Street Clinic	Somerset West Clinic
Gordon's Bay CDC	Wesbank Clinic
Cape Town Northern Health sub-District	
Bloekombos Clinic	Harmonie Clinic
Brackenfell Clinic	Northpine Clinic
Brighton Clinic	Scottsdene Clinic
Durbanville Clinic	Wallacedene Clinic
Fisantekraal Clinic	
Cape Town Southern Health sub-District	
Alphen Clinic	Parkwood Clinic
Claremont Clinic	Pelican Park Satellite Clinic
Diep River Clinic	Philippi Clinic
Fish Hoek Clinic	Redhill Satellite
Hout Bay Main Road Clinic	Seawind Clinic
Klip Road Clinic	Simon's Town Satellite Clinic
Lavender Hill Clinic	Strandfontein Clinic
Masiphumelele Clinic	Westlake Clinic
Muizenberg Clinic	Wynberg Clinic
Ocean View CDC	
Cape Town Western Health sub-District	
Albow Gardens CDC	Pella Satellite Clinic
Albow Gardens Mobile 1	Pinelands Satellite Clinic
Chapel Street Clinic	Protea Park Clinic
Factreton Clinic	Saxon Sea Clinic
Langa Clinic	Schotscheskloof Satellite Clinic
Maitland Clinic	Spencer Road Clinic
Melkbosstrand Clinic	Table View Clinic
Melkbosstrand Mobile 1	Wolwerivier Mobile 1
Witsand Mobile 1	

Khayelitsha Health sub-District	
Kuyasa CDC	Site B Youth Clinic
Luvuyo CDC	Site C Youth Clinic
Matthew Goniwe CDC	Town 2 CDC
Mayenzeke Clinic	Zakhele Clinic
Nolungile Clinic	
Klipfontein Health sub-District	
Guguletu Clinic	Masinedane Clinic
Hanover Park Clinic	Newfields Satellite Clinic
Hazendal Satellite Clinic	Nyanga Clinic
Heideveld Clinic	Ruimte Road Satellite Clinic
Honeyside Satellite Clinic	Silvertown Clinic
Lansdowne Clinic	Vuyani Clinic
Manenberg Clinic	
Mitchells Plain Health sub-District	
Crossroads 1 Clinic	Phumlani Clinic
Eastridge Clinic	Rocklands Clinic
Lentegeur Clinic	Tafelsig CDC
Mandalay Satellite Clinic	Weltevreden Valley Clinic
Mzamomhle Clinic	Westridge Clinic
Tygerberg Health sub-District	
Adriaanse Clinic	Netreg Clinic
Chestnut Satellite Clinic	Parow Clinic
Delft South Clinic	Ravensmead Clinic
Dirkie Uys Clinic	St Vincent (CCT) CDC
Elsies River Clinic	Uitsig Clinic
Kasselsvlei Clinic	Valhalla Park Clinic
Leonsdale Satellite Clinic	Total: 102

APPENDIX FOUR: DEFINITIONS

Table 4: Definition of contraceptive variable for each contraceptive method

First Method	Continued (1)	Discontinued (0)
IUCD	IUCD inserted.	Patient switches to other modern contraceptive method* (Excluding condoms**)
Sub-dermal implant (implanon NXT)	Etonogestrel (subdermal) implant inserted and not removed for ≥ 12 months.	Etonogestrel (subdermal) implant removed within < 12 months and not re-inserted.
OCP	If ≥ 12 packs dispensed in 12 months.	if < 12 packs dispensed in 12 months.
NET-EN	\geq six injections in a 12-month period.	$<$ six injections in a 12-month period.
DMPA-IM	\geq four injections in a 12-month period.	$<$ four injections in a 12-month period.
Dual method use	Male or female condom packs dispensed at, at least one visit.	No record of male or female condoms dispensed.
Method switching	Use of more than one contraceptive method in a 12-month period (excluding condoms).	Use of more than one contraceptive method in a 12-month period (excluding condoms).
Emergency Contraceptive Pill	Excluded from this analysis but included in study as a measure of unmet need for contraception.	Excluded from this analysis but included in study as a measure of unmet need for contraception.
Male condom	Included as part of dual method use.	
Female Condom		

*The City of Cape Town does not currently record IUCD removals.

**Patient could be using condoms as part of dual method use rather than as a primary contraceptive method.

Part B: Journal Manuscript

**Contraceptive continuation among women aged 15-49 utilising family planning services
in Cape Town, South Africa.**

Proposed Journal: PLOS ONE

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Abstract

There is a need to provide comprehensive contraceptive services that are consistent and that address the requirements of women, particularly young women who are at risk of unintended pregnancy.

Objectives

This study describes characteristics of contraceptive users accessing services and their contraceptive method usage patterns, including continuation, at public sector clinics in Cape Town, South Africa.

Methods

The study reviewed data on contraceptive users (n=217 274), aged 15-49 years accessing services across 102 public sector clinics. We calculated all method continuation and method-specific continuation for all hormonal methods. Multi-variate analysis was used to examine the relationship between sociodemographic and health characteristics with contraceptive continuation. P-values <0.05 were considered significant.

Results

Of the 217 274 women, 95.6% used short acting methods (68.2% injectables, 9.1% oral pills, 18.2% male & female condoms), while <5% used long-acting methods (implant 3.9%, intrauterine device 0.4%). The proportion of all method continuation was 39.5%, but the norethisterone enanthate injectable had the lowest method-specific continuation at 8%, followed by the oral pill at 11%, the two most popular contraceptive methods used by younger women. Contraceptive continuation was strongly associated with dual method use (OR: 1.78; 95% CI: 1.74-1.84), older age (25-49) (OR: 1.16; 95% CI:1.13-1.18) and had reduced odds if a user was on treatment for TB (OR: 0.64; 0.57-0.73).

Conclusions

Both method-specific and all-method contraceptive continuation were low, which indicates high rates of contraceptive method discontinuation without women switching their method. This may point to issues requiring attention at health provider, health system and client levels. Expanding patient-centered counselling and education, ongoing in-service education of health providers, and inventory monitoring systems to address issues such as stockouts are needed.

Introduction

Contraceptive use contributes to the planning and spacing of intended pregnancy. The right to limit, space and time children freely, was enshrined through the 1994 International Conference on Population and Development [1]. In addition, ensuring universal access to sexual and reproductive health and rights through the universal provision of family planning (FP) services is important to reduce the unmet need for contraception [1]. This contributes to one of the key facets of the World Health Organization (WHO) Sustainable Development, Goal Five “achieve gender equality and empower all women and girls” [2].

Evidence from 60 demographic and health surveys indicates that approximately one third (38%) of women stop using a modern contraceptive method by the first year and approximately half (55%) before the end of two years [3]. About a quarter of women in sub-Saharan Africa (SSA) currently use modern contraceptive methods, with levels highest in Southern Africa (83%) [4]. According to the South African (SA) Demographic Health Survey (SADHS) the contraceptive prevalence rate (CPR) (percentage of women who use any contraceptive method) is moderate at 48% with 99% of users using a modern contraceptive method [5]. This CPR is lower than other upper middle-income countries such as Brazil (79.5%), Mexico (72.1%) and Russia (78.6%) [6]. The main modern contraceptive methods used by women of reproductive age (15-49) in SA are injectables (depot medroxyprogesterone acetate intramuscular (DMPA-IM) and Norethisterone enanthate (NET-EN) at 25%, male condoms at 16% and oral pills at 7% [5]. Long-acting-reversible contraception (LARC) usage is estimated to be lower at 5% with usage of the Intrauterine Device (IUD) at 1% and the hormonal implant at 4% [5].

Although contraceptive use is relatively high, most SA studies report low continuation of contraceptives particularly, short-acting methods (SAM), ranging from as low as 40% for injectables [5, 7-12]. LARC methods such as the IUD and implant, however, generally have higher continuation rates of between 58% to 94% [5, 13-16]. This is due to LARC methods needing infrequent contact with a provider for insertion and removal, resulting in fewer opportunities for method discontinuation. The SADHS reported a 29% all method discontinuation rate for methods available in the public sector [5]. Within the SA context however, high rates of discontinuation may be due to transient relationships, particularly among younger and black African women, where co-habitation levels are lower [17]. If a woman is not sexually

active, she does not have unmet need. In SA, marriage rates are generally low [18-20], which is divergent from other countries in SSA [21]. Women may not see partners for long periods of time and therefore, may discontinue due to side effects, if they are not currently sexually active.

Women's dissatisfaction with a method are commonly linked to side effects, which are the most reported reason for contraceptive discontinuation across many studies. This is particularly true for hormonal contraceptive methods [7-9, 22-26]. These include changes in bleeding patterns, amenorrhea, weight gain and cramps [27]. Side effects are also an important reason for method switching and instead of discontinuing, users may switch methods [27, 28]. Method switching can therefore be an indication of method dissatisfaction [23], but may also be an indication of increasing quality of care-as more users switch methods instead of total contraceptive use cessation [29]. The short-acting 3-monthly DMPA-IM and 2-monthly NET-EN injectable – the most widely used contraceptive across SA at 25% usage nationally [5]– are reported to have high rates of discontinuation, method breaks and switching [11].

It can be argued that continuation rates are good measures of the overall use of contraceptive methods in a programme [30]. High rates of discontinuation limit the success of family planning programmes [30]. Consequently, identifying factors affecting continuation in different contexts can aid understanding women's reproductive health decision-making. Additionally, factors affecting contraceptive uptake and use, may affect continuation rates [31], suggesting a link between increased uptake of contraceptives and increased continuation. Continuation rates vary widely per method and per geographical location and socio-cultural norms [3, 26-28, 32, 33].

While some discontinuation is expected – due to a desire for fertility, breaks in sexual activity, not having a partner and menopause – discontinuation due to method dissatisfaction or method failure should be prevented through informed counselling and the provision of a diverse method mix to enable method switching [23]. However, discontinuation is generally higher among women who experience contraceptive failure or those who experience method usage issues, such as unwanted side effects [27]. These individuals are still at risk of an unintended pregnancy. Understanding the patterns of method uptake, use, discontinuation and switching among women of reproductive age could inform initiatives to increase contraceptive continuation thereby reducing unwanted fertility. Such knowledge could

contribute to reducing unmet need for family planning and improve women's reproductive health, helping SA to reach the goals of Family Planning 2020 (FP2020).

FP2020 specifies a human rights-based approach to family planning to provide voluntary contraception to all women [34]. Essential to this is patient-centered counselling that gives clients an informed choice by communicating three key messages – informing women about a method's side effect; how they can manage side effects; and what other methods are available for use [5]. The SADHS found that only 54% of women using modern methods in the public sector were given all above key messages to enable them to make an informed choice [5]. Furthermore, women have a right to choose to start, stop or continue using a contraceptive as necessary [35]. Effective family planning programmes enable women to use methods when they desire, ensure that they are satisfied with their method or, facilitate method switching to ensure continuity of method use when there is need [36].

Globally, the literature outlines health system elements (such as stock outs), service quality factors (such as informed counselling) and our socio-cultural understanding of issues such as side effects, motivation and pregnancy ambivalence as key factors explaining contraceptive discontinuation [27]. However, our understanding of the patterns of women's contraceptive usage per method could be strengthened. Therefore, the study aimed to enhance our understanding of contraceptive utilization patterns, while bridging the need for more comparative research across different contraceptive methods on the issue of continuation. In addition, given the high prevalence and significant impact of HIV and TB in SSA, considering these infections as covariates in contraceptive research and programming is critical for ensuring comprehensive and tailored approaches to reproductive health, reducing unintended pregnancies, preventing the transmission of infections, and improving overall health outcomes.

Materials and methods

Study design and sample

The sample comprised 217 274 women, aged 15-49 accessing contraceptive services in 102 City of Cape Town (CCT) primary health facilities from 01 January to 31 December 2017. The dataset of de-identified demographic and contraceptive use data was derived from routinely collected data from the

Patient Record and Health Management Information System (PREHMIS). The data were cleaned and all men, women under the age of 16 and over the age of 49 as well as women who did not access any family planning services were excluded.

Statistical analysis

Data was analyzed in three stages (univariate, bivariate and multivariable) using STATA (15.0). Categorical variables were expressed as frequencies and percentages for sample characteristics and continuous variables were summarized through calculating means and standard deviations (for normally distributed data). Significance levels for all statistical tests were set at $p < 0.05$.

The dependent variables were first method (baseline-women who started a method in 2017) and all-method continuation. For short acting methods (injectables and pills), first-method continuation (first method used in the study period) was defined as remaining on a baseline method (no switching) and continuing method repeats over the period. For long-acting methods the user needed to remain on a baseline method (without removing the contraceptive or switching methods). All-method continuation was measured by (1) remaining on a baseline method through-out the period for long-acting methods; (2) having the required amount of method repeats in the period for short-acting methods; (3) switching to a new method after cessation of a previous method (excluding condoms); and (4) returning to the same method after a 'break' in use – defined as returning to the method before the 12-month period ended. Discontinuation was explored in more depth and grouped by type of discontinuation (method switching, method breaks, method cessation), due to its complexity and higher proportions (see Table 1 in supplementary material for measurement of each method). This measurement of continuation was specific to the study data and has not been used in previous studies. However, this type of administrative data (clinic record, insurance claims, cross-sectional survey data) has been used to measure continuation in other studies with different statistical methods used [5, 33, 37, 38].

Independent variables consisted of the demographic and health factors available in the data set. This included age which was categorized as (15-24- adolescent girls and young women (AGYW) and 25-49- older women). Method type including short acting methods (DMPA-IM, NET-EN, oral pills) and

long-acting reversible methods (IUD and implant) was a dichotomous variable, categorized as user or non-user. Dual use (both condom and hormonal method use) was also a dichotomous variable, yes or no. Pregnancy in the last 12 months was dichotomized to yes or no, as was TB status and ART use. Lastly HIV and Sexually Transmitted Infections (STI) status was dichotomized as positive or negative. Not all variables were included in the final multivariate model as they were not statistically significant. Potentially important variables from the literature that were missing from the study include relationship status, socio-economic status, parity, and education [5, 12, 38-41]. HIV status and ART use as well as TB status are potentially important co-variables within the context of SSA and were available for inclusion in the study. They were selected as these affect the metabolism of certain contraceptive methods and may thus influence method selection for contraception and continuation in a high endemic setting.

Pearson's chi-squared tests were used to compare sample characteristics for normally distributed data with method-specific and all-method contraceptive continuation to establish the direction of the relationship. Chi-squared analysis was followed by bivariate and multivariate logistic regression modelling to assess predictors of method-specific and all-method continuation and to establish the direction and magnitude of association.

Data Cross-checking sub-study

A sub-study was conducted using the second data set to test the reliability of ascertaining contraceptive dispensing data from the PREHMIS system. Data cross-checking was ascertained through comparing the volumes of contraceptive methods ordered through the pharmacy system with the numbers of women receiving each method at a facility level. We found that volumes of drugs dispensed closely matched volumes ordered (see Figure 1 and 2 in supplementary material).

Ethical considerations

Ethics approval for the study was obtained from the Health Sciences Human Research Ethics Committee of the University of Cape Town (486/2018). The deidentified patient-level raw data was

stored on an encrypted system, Research Electronic Data Capture (REDCAP). The study was commissioned by service management as part of service improvement initiatives. This obviated the possibility and need for individual patient consent. The pharmacy dataset for the data cross-checking study did not contain any individual patient information, only aggregated facility data.

Results

Characteristics of the study population

The population (n=217 274) was made up of 62.2% (n=135 263) older adult users aged 25-49, while adolescent girls and young women (AGYW) (aged 15-24) made up 37.8% (n=82 011). The mean age of a contraceptive user in the sample was 28 years (sd= 8.041) (Table 1).

Table 1. Characteristics of study population, n=217 274

Characteristics	N	Median; Range
Age (years)	217 274 (100%)	27.69; 15.00-49.98
Age Category		
	N	Percentage (%)
15-24 (AGYW)	82 011	37.8
25-49 (Older women)	135 263	62.2
<i>Pregnancy in the 12-month period</i>	8 773	4.0
<i>HIV status</i>		
Positive	4 434	2.0
Negative	212 840	9.8
<i>ART use</i>	4 253	2.0
<i>TB in the period</i>		
Yes	2 738	1.3
No	214 536	98.7
<i>STI in the period</i>		
Yes	9 192	4.2
No	208 082	95.8
<i>Combined ART & TB medication use</i>	45	0.02

Contraceptive use and switching

During the study period most users used an injectable method (68.2%). Among these injectable users, 48.6% (n=114 412) were DMPA-IM users, while 19.5% were NET-EN users (n=45 980) (Table 2).

Table 2. Contraceptive methods ever used by women in the period, n=217 274

Contraceptive use (ever used in the period)	N	Percentage %
Injectable use	160 392	68.2
DMPA-IM	114 412	48.6
NET-EN	45 980	19.5
OCP	21 487	9.1
Implant	9 070	3.9
IUD	981	0.4
Exclusive condom use	42 777	18.2
Emergency Contraception Pill (ECP)	634	0.3
Exclusive emergency contraception pill use*	165	0.1
Overall condom use	122 416	52.0
<i>Female condoms</i>	5 421	4.4
<i>Male condoms</i>	74 208	60.6
<i>Dual male & female condom use</i>	42 787	35.0
Dual hormonal and condom usage	78 680	36.2

*The only method used in the period one or more times was the emergency contraception pill. This is generally used in cases of method failure or unprotected sex.

At baseline, the oral pill was used by 9.1% of women (n= 21 847) while the IUD was used by 0.42% (n=981) and the implant was used by 3.9% (n=9 070). Over half (52.02%, n=122 416) of users had used condoms during the period, while 36.2% (n=78 680) were dual hormonal and condom users (Table 2). In addition, among all method users (n=217 274), method switching was 7.9% (n=17 274). Although ECP is not classified as a contraceptive, these data are reported as it represents an unmet need for contraception in the population 0.3% (n=634).

Contraceptive continuation

First method continuation and associated factors

First method (baseline) continuation was highest for the IUD (88.0%, n= 504), followed by the implant (66.6%, n=6 034) while SAM generally had lower continuation and adherence. Several methods had continuation rates less than 20% such as NET-EN (8.2%) (n=3 240), followed by the oral pill at 11.3% (n=1 931) and the DMPA-IM injectable, 17.6% (n=17 731) (Table 3).

Table 3. Method-specific discontinuation, continuation and switching patterns of baseline hormonal method users, n=166 664.

Method	Used at baseline. % (n) ^a	Used baseline method only. % (n)	Continued % (n)	Discontinued % (n)			
				Discontinued due to method-switching	Discontinued for reasons other than switching ^b	Discontinued due to 'method break' ^c	Overall
DMPA-IM	46.4% (100 808)	93.8% (94 535)	17.6% (17 731)	82.4% (83 077)	7.6% (6 273)	73.7% (61 247)	18.7% (15 557)
NET-EN	18.1% (39 301)	85.9% (33 777)	8.2% (3 240)	91.8% (36 061)	15.3% (5 524)	69.1% (24 906)	15.6% (5 631)
OCP	7.8% (16 912)	89.4% (15 126)	11.3% (1 913)	88.7% (14 999)	11.9% (1 786)	74.9% (11 230)	13.2% (1 983)
Implant	4.2% (9070)	66.6% (6 043)	40.3% (3 658)	59.7 % (5 412)	36.6% (1981)	63.4% (3431)	-
IUD ^d	0.3%(573)	87.9% (504)	87.9% (504)	12.0% (69)	12.0% (69)	-	-
Total	100% (166 664)	90.0% (149 985)	14.4% (24 046)	83.8% (139 618)	9.4% (15 633)	60.5% (100 814)	13.9% (23 171)

^a Remaining baseline users used condoms and emergency contraception at baseline.

^b only a few contraceptive method repeats in period (half or less-than half the required method repeats, then no more data on client).

^c break in contraceptive method repeats, then return to same method.

^d IUD removals not recorded in PREHMIS.

Baseline DMPA-IM users made up nearly half of the sample 46.40% (n=100 808). Less than 20% (17.6% (n=17 731)) of baseline DMPA-IM users continued their method over the timeframe, and few 7.6% (n=6273) switched to other hormonal methods. However, discontinuation due to reasons other than switching was high at 73.7% (n=61 247) with two or less repeats over the year (the required number is

four injections in a 12-month period) (Table 3). (For a breakdown of DMPA-IM usage in the period, see Figure 3 in supplementary material).

In addition, among first method (baseline) NET-EN users (n=39 301), a large proportion 91.8% (n=36 061) discontinued use of the method during the period. Among these discontinuers, 15.3% (n=5 524) switched to another method, while most users 69.1% (n=24 906) discontinued without switching to another method. Furthermore, approximately 15.6% (n=5 631) of these users did not have the required six injections in the period, but rather took ‘method breaks’ (several months lapsed before they received their re-injection). (For a breakdown of NET-EN usage in the period, see Figure 4 in supplementary material). Few users continued with the method through-out the period (8.24%, n=3 240) (Table 3).

All method continuation and associated factors

Almost 40% (39.5%) of hormonal contraceptive users continued their method (Figure 1).

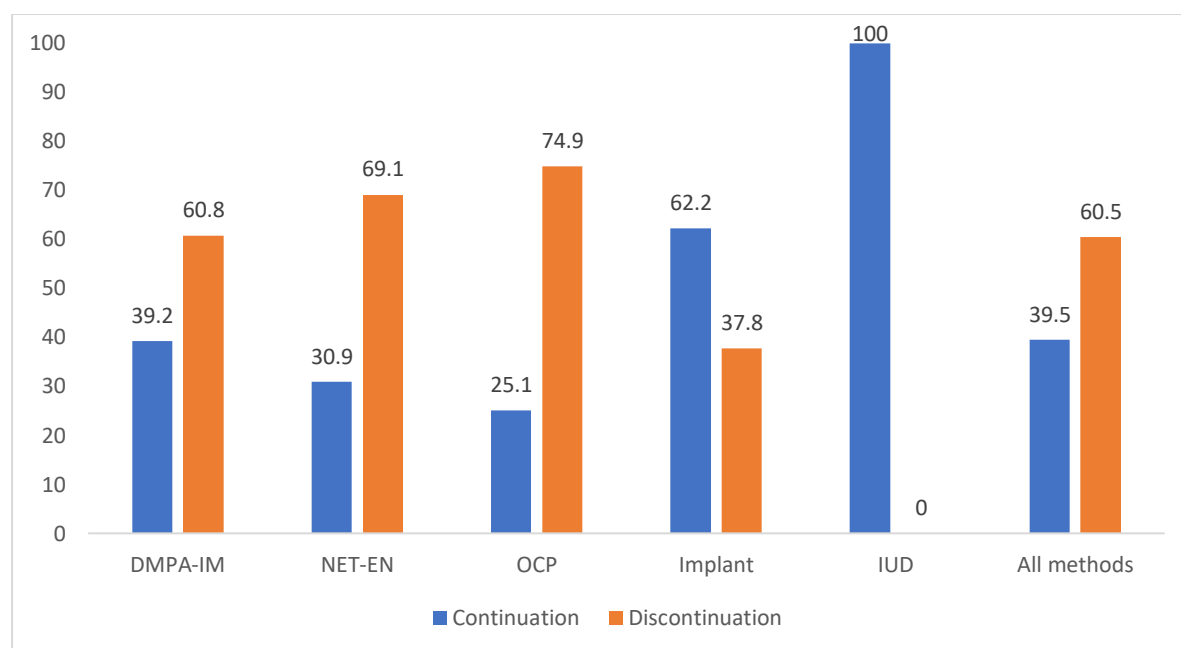


Figure 1. all-method and method-specific contraceptive continuation among hormonal contraceptive users

Chi square analysis pointed to significant relationships between dual method use, age, and TB status with continuation of methods. Bivariate analyses further suggested a positive relationship between older

age, dual method use and continuation, as well as a negative relationship with TB treatment and continuation (see Table 2 and Table 3 in supplementary material).

We adjusted all-method continuation for age (15-24, 25-49), dual use, TB treatment, HIV status, whether they were a short acting or long- acting contraceptive user at baseline and STI treatment. Dual use had 1.81 increased odds (95% CI: 1.80;1.90) of continuation. Further, a higher age (25-49) was associated with an increased odds of continuation (1.20,95% CI: 1.17; 1.22), while receiving TB treatment had a reduced odds (0.64, 95% CI: 0.58; 0.74) of continuation (Table 4).

Table 4. Multivariate logistic regression exploring factors associated with all-method contraceptive continuation among hormonal contraceptive users, n=166 664

Characteristic	Odds ratio	p-value	Confidence interval	Adjusted odds ratio	p-value	Confidence interval
15-24	Ref					
25-49	1.16	0.00	1.13;1.18	1.20	p<0.001	1.17; 1.22
No dual use	Ref					
Dual use	1.78	0.00	1.74;1.84	1.81	p<0.001	1.80; 1.90
No TB treat	Ref					
TB treat	0.64	0.00	0.57;0.73	0.65	p<0.001	0.58; 0.74

Discussion

This study found that contraceptive continuation among hormonal contraceptive users was low among women obtaining contraceptive methods through public sector CCT facilities in 2017, as well as low levels of method adherence (consistent use of the method within the method prescribing parameters). This was due to the high usage of short-acting methods (SAM) and early removal of long-acting reversible contraceptive (LARC) methods, without switching to a new method.

Overall, all-method contraceptive continuation was 39.5%, which is generally low compared to other studies in the same setting (85.8%, 66%) as well as to the national estimate of 71% cited in the 2016 SADHS [5, 16, 25]. Despite this, all-method continuation was generally higher compared to method-specific

continuation, as it incorporates method switching [14]. The low proportion of all-method continuation in this population could be attributed to high SAM use (95.6%) which is negatively impacted by lower method adherence [42]. This is important within the context of how continuation was measured within this study, with SAM being measured by adherence to the method itself through repeat appointment attendance and dispensing of methods. The low adherence was due to method breaks/temporary discontinuation which often occurs among injectable users, and studies conducted elsewhere reported method breaks in up to 43.6% of injectable users [7]. This may occur intentionally with users wanting to give their bodies a ‘break’ or because healthcare providers did not want to provide a re-injection due to the client being late for their appointment and potentially pregnant or because they were not sexually active at the time [7, 10, 43]. In addition, there was a high discontinuation rate of the implant due to early removal, a LARC method which elsewhere has been found to have higher rates of continuation across studies and countries [5, 27, 44-46].

The main factors associated with continuation in the study were higher age and dual method use. These findings are consistent with other studies in the region [7, 16, 25]. Our findings are consistent with other studies in SA that show that older women are a more motivated contraceptive user group [25]. Being on TB treatment was negatively associated with continuation. This result could be due to national clinical guidelines stipulating cessation of use of combined hormonal contraceptives such as the oral pill, injectables, patches and vaginal rings when using TB drugs [47], which may influence method choice, provider prescribing patterns and method switching. Interestingly, HIV status, ART use and STI treatment were not significantly associated with continuation. Some studies have found that HIV positive women are a more motivated contraceptive user group [48]. This may be in part attributable to family planning becoming an important part of HIV standards of care [48]. TB and HIV infections were selected as these affect the metabolism of certain contraceptive methods and may thus influence method selection for contraception in a high prevalence setting such as SA.

Contraceptive usage trends observed are comparable to other contraceptive studies. While SAM (injectables and oral pills) had the highest usage, it had the lowest proportion of first method (baseline) continuation (NET-EN-8.2%, oral pills-11.3%, DMPA-IM-17.6%). This is consistent with findings from

a 60-country analysis across Africa, Asia, Latin America, and Eastern Europe, which showed that SAM have the highest discontinuation rates [39].

We found poorer levels of first-method continuation than those found in other SA studies [7, 11, 14, 22, 49]. These higher rates of discontinuation in comparison to LARC methods can be explained by the ease with which SAMs can be discontinued without the intervention of a healthcare provider [23, 33]. However, within the SA context, high rates of discontinuation may often be due to transient relationships. If a woman is not in a relationship and is not sexually active, she does not have unmet need. In SA, marriage and cohabitation rates are very low [17], which is different from other countries in SSA [21]. Women may not see partners for long periods of time and therefore, may discontinue due to side effects, if they are not currently sexually active or may use condoms provided by her partner.

The high level of first method (baseline) discontinuation may be due to method dissatisfaction because of side effects, the most common reason for method switching and discontinuation [27]. Side effects, leading to method switching, are commonly due to disturbances in menstrual patterns or method dissatisfaction [23]. However, this switching generally occurs in motivated contraceptive users wanting to avoid a pregnancy and are influenced by factors such as the method mix available [23]. Although method mix was not measured directly in the study, a limited method mix, the preponderance of injectable usage and drug stock outs may explain the lower proportions of switching, which varied from facility to facility. Stock outs of some contraceptives may deter women from switching contraceptive methods as no other preferable method is available.

In addition to frequent usage of SAM and low continuation of methods, there was also low switching of methods among all users. The study found that <10% of women switched methods overall (7.9%), which is similar to rates found in a 1995 SA study (11.9%) [25] and the national estimate being much lower (4%) [5]. However, a more recent 2019 study in Cape Town found higher levels and more frequent switching, particularly for injectable and oral pill users [11]. The low level of switching combined with high discontinuation found in our study could be due to dissatisfaction with SAM as there was high injectable usage in the sample, with 68% of users using injectable methods at least once, combined with a limited method mix at several facilities and pharmacy stock outs. Baseline SAM users had particularly low levels

of switching (DMPA-IM-7.6%, NET-EN-15.3% and OCP-11.9%). Switching to a more suitable contraceptive tailored to the user's needs should be encouraged for these method users if they are dissatisfied with their current method, are experiencing untenable side effects or have unmet need.

Conversely, method switching among baseline implant users was high (36%). Issues have been noted with the implant at the provider, client and method level leading to early removals and a decline in its use [50-53]. Regarding method issues, a local study found that among discontinuers, up to 90% discontinued due to side effects, such as bleeding pattern changes and headaches [52]. After initial high levels of uptake following its introduction in SA in 2014, there has been an almost 50% decline in insertions year upon year [50]. This is mirrored in our study which found that less than half of users (40%) continued this method, leading to low baseline method continuation. Although switching for baseline implant users were higher than other methods, 63% of implant discontinuers never switched to a new method but ceased contraceptive use altogether, indicating issues with continuation at the client level. This high level of discontinuation normally does not occur with LARC methods which generally have high continuation at $\geq 84\%$ in multiple regions globally [44, 52, 54]. This indicates that the implant may be a method with high user dissatisfaction in this population, most likely linked to side effects, inadequate pre-insertion counselling or is being discouraged by providers. Regarding provider level issues, a qualitative study found that instead of promoting the dual use of condoms and the implant, providers generally preferred to remove the implant in HIV-infected women (using efavirenz) as they did not believe users would be adherent to the condom, while the implant has reduced efficacy with this medication [55]. Providers also expressed contraceptive preferences which discouraged the use of implants for younger women [55]. In contrast, the IUD had the lowest baseline usage of $<0.5\%$ but had the highest first method continuation at 87%. The method also requires a trained health-care professional to insert and remove it [33], but, compared to the implant, displayed higher continuation and less switching. This may indicate that it is initiated and used by a more motivated group of contraceptive users.

Method switching (which could also indicate lower method satisfaction) is considered a proxy measure of increasing quality of care, with increased switching being an indication of better service quality [30]. Therefore, switching needs to be encouraged within this population when methods are no longer suitable

or preferred by women. In addition, comprehensive patient centered counselling is important and has been linked to both increased continuation [56] and higher levels of switching [28]. This counselling should be client centered, underpinned by client rights, providing the salient informational messaging (informing women about a methods side effect, how they can manage side effects and what other methods are available for use) [5].

Another factor which contributes to discontinuation of baseline methods is poor method adherence. This is particularly pronounced for injectable users amongst whom poor method adherence and high discontinuation rates have been noted [11, 22, 27]. The study shows high levels of injectable use coupled with low contraceptive continuation of injectables, leaving women vulnerable to unintended pregnancy if they have unmet need. This is concerning and needs attention especially as large proportions of young women use injectables. A 2001 study found a continuation rate of 42% at one year for DMPA-IM and 41% for NET-EN users. By two years, this dropped to 21% [22]. First method (baseline) continuation was even lower in our study.

Discontinuation due to ‘method-breaks’ for injectables has been explored in the literature, with many first method discontinuers returning to the method after a break in use [7]. In a local 2004 study, clients who were late for re-injection in two provinces of SA were told to return at their next menses [43]. This would influence method break periods and participants returning to their method or continuing overall. Within this study, substantial proportions, 18.7%, 15.6% and 13.2%, of ‘method breaks’ occurred with the use of DMPA-IM, NET-EN and the oral pill respectively. However, NET-EN displayed the lowest first-method continuation within the study at 8.24%. Nearly 60% of all baseline NET-EN users are young women aged 15-24. This key sub-group are most at risk of an unintended pregnancy and simultaneously at higher risk of HIV-1 acquisition [40]. Disturbingly, NET-EN is also associated with all method discontinuation in the study. The evidence suggests that if contraceptive counselling is not engaged in a shared decision-making, patient-centered framework, a woman is less likely to understand why she is using the method she was given and therefore less likely to use the method correctly [57, 58]. High rates of discontinuation may indicate that stockouts were common in 2017, and that women were not happy to switch to another available method.

Recommendations

The disparity between LARC and SAM for continuation may be in part attributable to the higher level of adherence required for SAM, the number of health facility visits required and potential method stockouts as was found in other studies [7, 10, 33, 43]. Regardless, the method mix available should include both LARC and SAM as women use methods which are personally preferable to their changing needs. Existing evidence shows that an expansive method mix is an important component of the quality of care [29, 59-61]. Current programming should educate users on the importance of using SAM consistently to avoid an unplanned pregnancy and emphasize the importance of method repeats. It should also establish the client's level of satisfaction with their current method and if they have unmet need and if necessary, facilitate switching of methods. Women should be informed about the range of contraceptive choices upfront, as well as adequate information and counselling, particularly on method side effects. Should they not desire fertility, this would facilitate them making an informed choice to ensure continuation of contraception or method switching as opposed to discontinuation. The implications of these findings are that women need to be encouraged to voice their preferences and concerns around contraception. The low levels of continuation within the study can be viewed as a missed opportunity to sustain contraceptive use and should be used as an opportunity to improve upon service delivery.

Limitations

Due to the use of routine retrospective data, discontinuation in the study may be slightly lower for SAM (Table 3). Several participants could have entered the study period toward the end of the year and therefore only reflected as having one or possibly two method repeats. It is unknown whether they followed through with this method in the following year as the study data only looks at 12 months (January-December). It is also unknown whether the baseline method used in the study was their preferred method. However, these participants only make up a small proportion of the sample (2.5%). For SAM, continuation was measured by a count of method repeats for each visit and therefore, is less comparable to other continuation studies in SA (which measure continuation rates through self-report or survey data). Another potential limitation is that women may have decided to obtain their method through the private

sector or the provincial health service in cases where there were stock outs, which our study was also unable to measure. In addition, within the study, we do not know why users discontinued and so the gold standard of discontinuation and continuation requires knowledge of whether the woman was sexually active or not and therefore if there was unmet need. This is especially true in the context of SA where partner co-habitation and marriage rates are low [17, 20] and women may see partners infrequently. It is assumed that once contraception is initiated, there is an ongoing need for contraception. Without data which could be supplied by another study design, this is impossible to ascertain. Therefore, the unmet need is probably overstated in the study. Nonetheless, the results of this study have very practical applications for training and service delivery across city facilities, identifying opportunities for improvement.

Conclusion

Our study analyzed routine data collected over a calendar year of close to a quarter of a million women who attended CCT services for family planning. Key findings were the low continuation of contraceptive methods without switching to another method and low adherence to method repeats in the case of short acting methods (SAM), particularly both injectable methods – DMPA-IM and NET- EN. The latter is used by many young women. Possible reasons for this at a user level may be dissatisfaction with the method and unacceptable side effects or that they have no need for the method at that time due to a lack of sexual activity. At a system level, stock outs and at a provider level, provider preferences particularly the removal of implants. Our results emphasize the need to expand the method mix available by training more providers, and better facilitate method switching to increase continuation. In addition, contraceptive counselling should adopt a patient-centered approach. Healthcare providers should give women information and options to allow for informed choices about contraception. Having skilled staff and available methods that address users' needs and preferences should increase contraceptive continuation where there is unmet need and therefore protect against unplanned and unwanted pregnancies that jeopardize women's wellbeing. Additional information on the reasons for discontinuation and whether women have unmet need is needed for future studies.

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Supporting information

- S1 Table. Definition of first method contraceptive variable for each contraceptive method.**
- S2 Fig. Contraceptive ordering versus dispensing data across high, medium, and low volume facilities, March-September 2017.**
- S3 Fig. Ordering vs dispensing data by type of health facility (high, med, low volume) and contraceptive method, March-September 2017.**
- S4 Fig. DMPA-IM injectable use among all users, January-December 2017.**
- S5 Fig. NET-EN injectable use among all users, January-December 2017.**
- S6 Table. Chi Square Analysis Exploring Factors Associated with Method Specific Contraceptive Continuation among Hormonal Contraceptive users.**
- S7 Table. Bivariate logistic regression exploring factors Associated with Method Specific Contraceptive Continuation among Hormonal Contraceptive users.**
- S8 Fig. Distribution of method switching in the sample, n=217 274.**

Part C: Appendices

APPENDIX ONE: ACKNOWLEDGMENTS

Ms. Carron Naidoo was responsible for the design of the study, analysis and interpretation of the data and write up of the manuscript.

Associate Professor Virginia Zweigenthal and Associate Professor Jane Harries critically revised the manuscript for intellectual content and approved the finalized manuscript.

APPENDIX TWO: ETHICS APPROVAL LETTER



UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee



Room E53-46 Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6626
Email: shuretta.thomas@uct.ac.za

Website: www.health.uct.ac.za/fhs/research/humanethics/forms

10 August 2018

HREC REF: 486/2018

Dr V Zweigenthal
Public Health & Family Medicine
Room 4.27
Falmouth Building

Dear Dr Zweigenthal

PROJECT TITLE: CONTRACEPTIVE CONTINUATION AMONG WOMEN AGED 15-49 UTILISING CITY OF CAPE TOWN FAMILY PLANNING SERVICES (MASTERS CANDIDATE - MS C NAIDOO)

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned.

Approval is granted for one year until the 30 August 2019.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

Please quote the HREC REF in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate Institutional approval, where necessary, before the research may occur.

The HREC acknowledge that the student, Carron Naidoo will also be involved in this study.

Yours sincerely

Signed by candidate

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE
Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB00001938

HREC 486/2018

APPENDIX THREE: ETHICS RENEWAL



UNIVERSITY OF CAPE TOWN
UNIVERSITEIT VAN KAAPSTAD

FACULTY OF HEALTH SCIENCES
Human Research Ethics Committee



FHS016: Annual Progress Report / Renewal

HREC office use only (FWA00001637; IRB00001938)			
This serves as notification of annual approval, including any documentation described below.			
<input checked="" type="checkbox"/> Approved	Annual progress report	Approved until/next renewal date	30 11 21
<input type="checkbox"/> Not approved	See attached comments		
Signature Chairperson of the HREC/ Designee	Signed by candidate	Date Signed	27/11/2020

Note: Please note that incomplete submissions will not be reviewed.
Please email this form and supporting documents (if applicable) in a combined pdf-file to hrec-enquiries@uct.ac.za.
Please clarify your plan for research-related activities during COVID-19 lockdown

Comments to PI from the HREC
<i>The HREC hope the medical condition has resolved? Thank you for the decision document.</i>
Signed by candidate

Principal Investigator to complete the following:

1. Protocol information

Date (when submitting this form)	24 November 2020		
HREC REF Number	486/2018	Current Ethics Approval was granted until	30 August 2019
Protocol title	Contraceptive continuation among women aged 15-49 utilising City of Cape Town family planning services.		
Protocol number (if applicable)	N/A		
Are there any sub-studies linked to this study?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
If yes, could you please provide the HREC Ref's for all sub-studies? Note: A separate FHS016 must be submitted for each sub-study.	N/A		
Principal Investigator	Dr Virginia Zweigenthal (Masters student: Carron Naidoo)		



Department / Office Internal Mail Address	Public Health and Family Medicine Room 4.27 Falmouth Building
------------------------------------------------------------	---------------------------------------------------------------------

1.1 Does this protocol receive US Federal funding?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
1.2 If the study receives US Federal Funding, does the annual report require full committee approval? Note: Any annual approvals for Full Committee review MUST be submitted on the monthly HREC submission dates. (Please send electronic copy for full committee review to hrec-enquiries@uct.ac.za)	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No

If yes in 1.2 please complete section 1.3 below for invoicing purposes

1.3 Annual Approval for full committee review	- R 3450 (inclusive of vat)
-----------------------------------------------	-----------------------------

For invoicing purposes, please provide:

Sponsor's name	
Contact person	
Address	
Telephone number	
Email Address	

2. List of documentation for approval

No documents to approve, just amendment of ethics period required to complete and hand in thesis.

3. Protocol status (tick ✓)

<input type="checkbox"/>	Open to enrolment
<input type="checkbox"/>	Closed to enrolment (tick ✓)
<input type="checkbox"/>	Research-related activities are ongoing
<input type="checkbox"/>	Research-related activities are complete, long-term follow-up only
<input checked="" type="checkbox"/>	Research-related activities are complete, data analysis only
<input type="checkbox"/>	Main study is complete but sub-study research-related activities are ongoing
<input type="checkbox"/>	Study is closed → Please submit a Study Closure Form (FHS010)



The study is a retrospective medical chart review of women accessing family planning services at city of Cape Town clinics within the period of 1 year. Ethics for this study was granted until 30 August 2019 and expired last year.

The research is complete and is in the thesis draft review and edit stage. I completed a progress report last year but was unable to physically bring it to the Ethics committee (see below) due to a spinal injury which I subsequently received a medical leave of absence for, for 2020.

I would therefore like to request an extension on my ethics to enable to me to complete my write up and submit for examination before the 2020 academic year end.

This project requires no special requirements for human subjects research during COVID-19 as it is a retrospective medical chart review study and has no physical contact with the research participants.

8. Protocol violations and exceptions (tick ✓ all that apply)

<input checked="" type="checkbox"/>	No prior violations or exceptions have occurred since the original approval
<input type="checkbox"/>	Prior violations or exceptions have been reported since the last review and have already been acknowledged or approved
<input type="checkbox"/>	Unreported minor violations that have occurred since the last review, as well as significant deviations not yet reported, are attached for review

9. Amendments (tick ✓ all that apply)

<input checked="" type="checkbox"/>	No prior amendments have been made since the original approval
<input type="checkbox"/>	Prior amendments have been reported since the last review and have already been approved
<input type="checkbox"/>	New protocol changes/ amendments are requested as part of this continuing review (See note below)

Note: If new protocol changes are being requested in this review, please complete an amendment form (FHS006).

Specific changes in the amended protocol and consent/assent forms must be **bolded**, *italicised* or tracked and all changes must include a rationale.

10. Adverse events

10.1 Please provide below or attach a narrative summary of serious adverse events and/ or unanticipated problems since the last progress report. Please indicate changes made to the protocol and informed consent document(s) as a result (if not already reported to the HREC). Please comment on whether causality to any study procedure or intervention could be established.

N/A

10.2 Have participants received appropriate treatment/ follow-up/ referral when indicated (e.g. in the case of abnormal or incidental clinical findings, distress or anxiety)?

<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Not applicable
If yes, please describe:		

APPENDIX FOUR: ADDITIONAL SELECTED TABLES AND FIGURES

- a. Table 1: Definition of first method (baseline) contraceptive variable for each contraceptive method

First Method	Continued (1)	Discontinued (0)
IUCD	IUCD inserted.	Patient switches to other modern contraceptive method* (Excluding condoms**)
Sub-dermal implant (implanon NXT)	Etonogestrel (subdermal) implant inserted and not removed for ≥ 12 months.	Etonogestrel (subdermal) implant removed within < 12 months and not re-inserted.
OCP	If ≥ 12 packs dispensed in 12 months.	if < 12 packs dispensed in 12 months.
NET-EN	\geq six injections in a 12-month period.	$<$ six injections in a 12-month period.
DMPA-IM	\geq four injections in a 12-month period.	$<$ four injections in a 12-month period.
Dual method use	Male or female condom packs dispensed at, at least one visit.	No record of male or female condoms dispensed.
Method switching	Use of more than one contraceptive method in a 12-month period (excluding condoms).	Use of more than one contraceptive method in a 12-month period (excluding condoms).
Emergency Contraceptive Pill	Excluded from this analysis but included in study as a measure of unmet need for contraception.	Excluded from this analysis but included in study as a measure of unmet need for contraception.
Male condom	Included as part of dual method use.	
Female Condom		

*The City of Cape Town does not currently record IUCD removals.

**Patient could be using condoms as part of dual method use rather than as a primary contraceptive method. Condoms cannot be tracked as a primary usage method as they are freely and widely available, not just available within family planning appointments.

b. Data cross-check sub-study

The data table below refers to cross-checking of the dispensing data drawn from all CCT facilities to verify whether contraceptive usage and dispensing information within the main study was reliable. Figure 1 below shows that dispensing practices across different types of facilities is generally on par with what is ordered. This excludes the implant, which in general there was more dispensed than ordered (there may have been surplus stock before the study started). This may have led to stock outs of the method and affected continuation of this method. Overall, however, we can see that the CCT PREHMIS system is generally reliable for the purposes of the study with dispensed volumes generally matching volumes ordered per method.

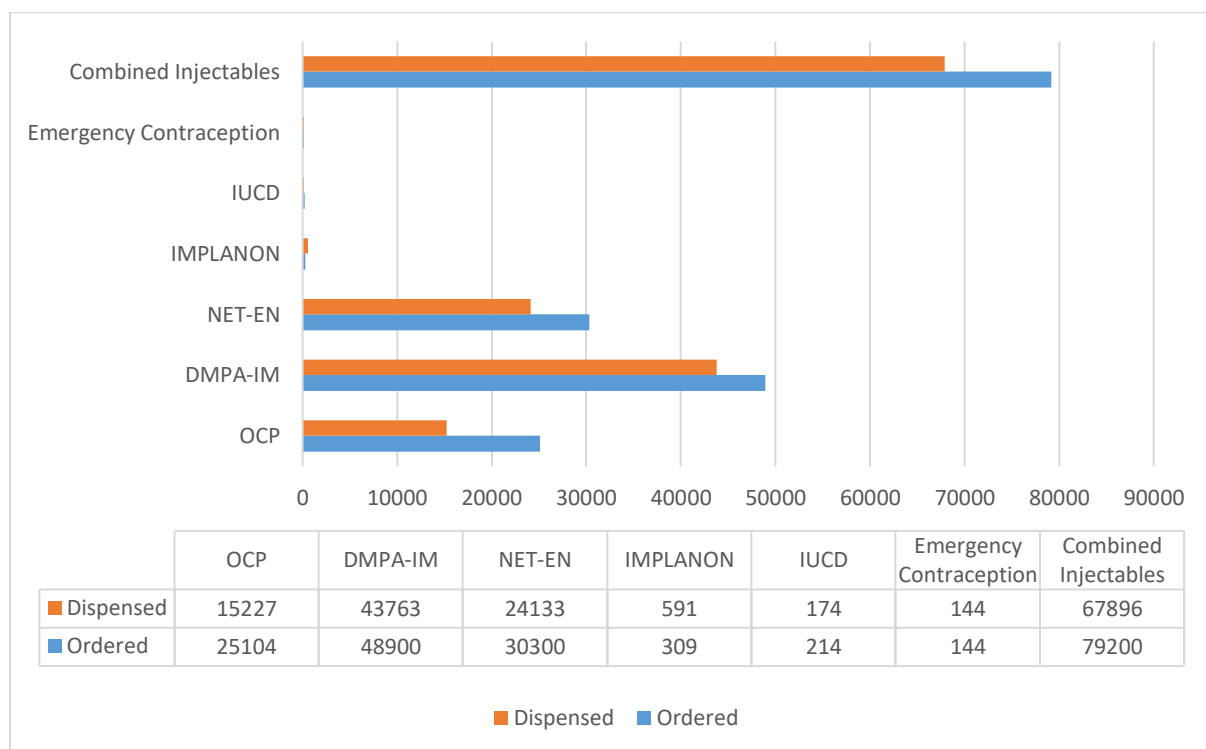


Figure 1: Contraceptive ordering versus dispensing data in high, medium, and low volume facilities, March-September 2017

To break this down further, we explored the clinics by high, medium, and low volume in terms of dispensing and ordering per contraceptive method. In general, there was not great variation between facilities ordering and dispensing data. However, high volume facilities ordering, and dispensing data showed the greatest variation. This could be due to the practice of facilities ‘sharing’ stock, so if a method has a stock out and a client is seeking this method, the facility will borrow from a nearby facility, rather than send the client away, if possible. This would occur more frequently at high volume facilities as they have a client volume of up to 100 000 people.

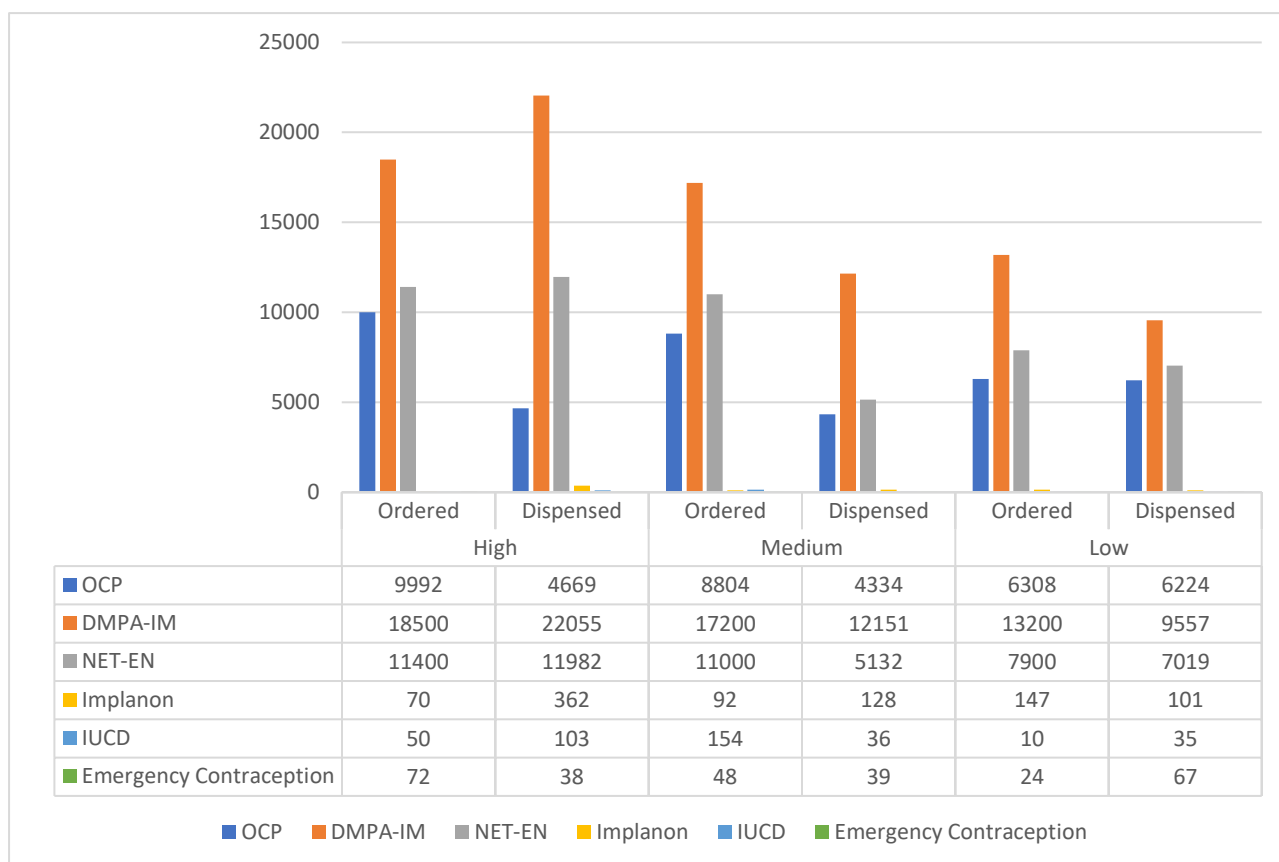
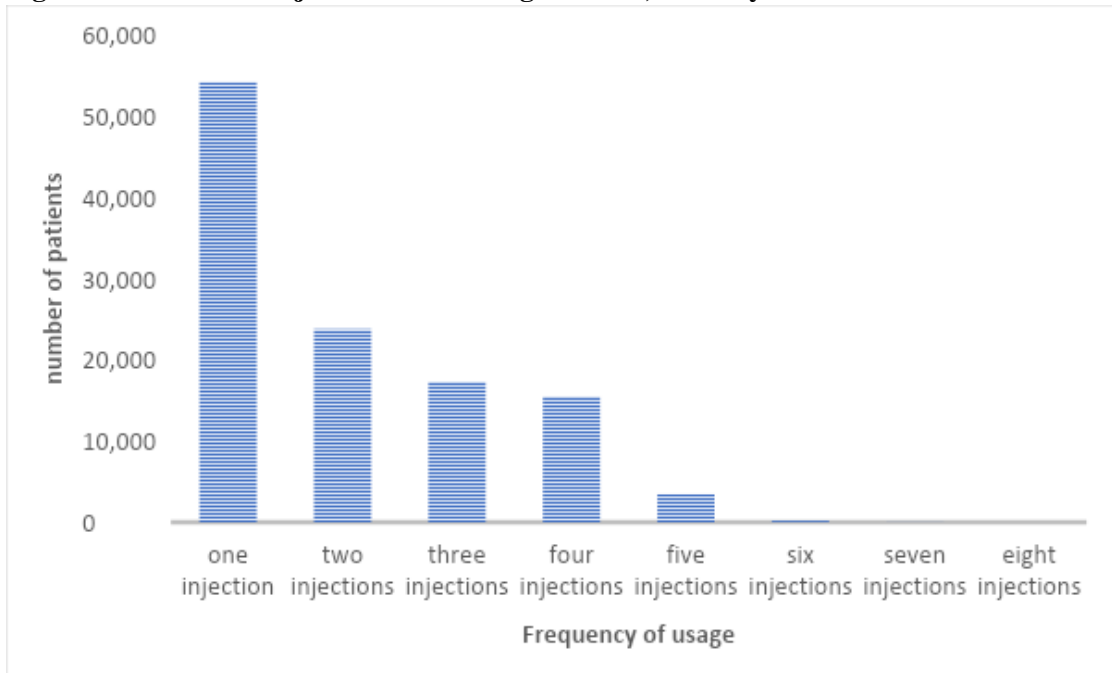


Figure 2: Ordering vs Dispensing data by type of Health Facility (high, med, low volume) and Contraceptive Method, March-September 2017

- c. Figure Three describes the usage proportions of all DMPA-IM users over a 12-month period. The figure illustrates that most users only had one injection within the period, where up to four injections are required within the timeframe. This illustrates poor adherence to the method overall.

Figure 3: DMPA-IM injectable use among all users, January-December 2017



- d. Figure Four describes the usage proportions of all NET-EN users over a 12-month period. The figure illustrates that most users only had one injection within the period, where up to six injections are required within the timeframe. This illustrates poor adherence to the method overall.

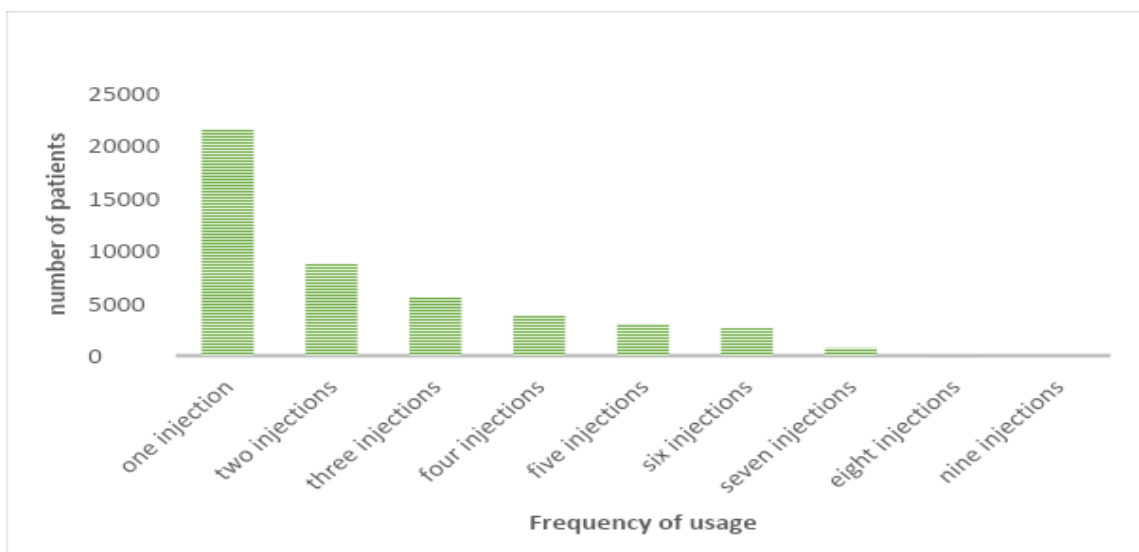


Figure 4: NET-EN injectable use among all users, January-December 2017

- f. As below, Chi Square analysis determined that there was a significant relationship between dual method use (condom and hormonal method use) and continuation ($p=0.00001$). Age was also significantly related ($p=0.00004$) to continuation of SAM (DMPA-IM, NET-EN and oral pill). However, for LARC users (Implant, IUD) this relationship was not significant ($p=0.56$; $p=0.44$). TB status was associated with the continuation of the DMPA-IM injectable and the implant ($p<0.001$).

Table 2. Chi Square Analysis Exploring Factors Associated with Method Specific Contraceptive Continuation among Hormonal Contraceptive users.

Characteristic	DMPA-IM p-value ^a	NET-EN p-value	Oral Pill p-value	Implant p-value	IUD p-value
Age category					
15-24	p<0.001	p<0.001	p<0.001	P=0.86	P=0.44
25-49					
Dual use	p<0.001	p<0.001	p<0.001	p<0.001	p<0.001
Pregnancy	p<0.001	p<0.001	p<0.001	p<0.001	p= 0.52
HIV status	p=0.25	p=0.37	p=0.89	p=0.10	p=0.36
TB status	p<0.001	p=0.33	p=0.21	p<0.001	p=0.60
STI	p= 0.41	p=0.23	p=0.02	p= 0.17	p=0.49

- g. Bivariate analyses in Table 3 illustrate that the dual use of condoms and a hormonal method were more likely to result in continuation for all methods. If a user was on treatment for TB in the period, they were less likely to engage in continuation when they were baseline DMPA-IM users (0.38, 95% CI: 0.3; 0.48) or implant users (0.30, 95% CI: 0.14; 0.64).

Table 3. Bivariate logistic regression exploring factors Associated with Method Specific Contraceptive Continuation among Hormonal Contraceptive Users

Characteristic	DMPA-IM			NET-EN			Oral Pill			Implant			IUD		
	OR, p-value ^a	·	95% CI	OR, p-value ^a	·	95% CI	OR, p-value ^a	·	95% CI	OR, p-value ^a	·	95% CI	OR, p-value ^a	·	95% CI
Age Category															
15-24 (ref)	1.00			1.00			1.00			1.00			1.00		
25-49	0.75	0.00	0.7;0.78	1.62	0.00	1.51;1.74	1.72	0.00	1.53;1.93	0.98	0.70	0.90;1.08	1.11	0.72	0.65;1.91
No Dual use (ref)	1.00			1.00			1.00			1.00			1.00		
Dual use	1.28	0.00	1.2;1.32	1.71	0.00	1.59;1.84	1.30	0.00	1.18;1.43	0.92	0.05	0.84;0.99	0.60	0.05	0.36;1.00
No TB treatment (ref)	1.00			1.00			1.00			1.00			1.00		
TB treatment	0.38	0.00	0.3;0.48	0.74	0.217	0.46;1.20	0.39	0.19	0.09;1.61	0.30	0.00	0.14;0.64	1.00	-	-

^aSignificance level at p<0.05

APPENDIX FIVE: INSTRUCTIONS FOR AUTHORS: PLOS ONE

Submission Guidelines

Style and Format

File format

Manuscript files can be in the following formats: DOC, DOCX, or RTF. Microsoft Word documents should not be locked or protected.

LaTeX manuscripts must be submitted as PDFs. Read the LaTeX guidelines.

Length

Manuscripts can be any length. There are no restrictions on word count, number of figures, or amount of supporting information.

We encourage you to present and discuss your findings concisely.

Font

Use a standard font size and any standard font, except for the font named “Symbol”. To add symbols to the manuscript, use the Insert → Symbol function in your word processor or paste in the appropriate Unicode character.

Headings

Limit manuscript sections and sub-sections to three heading levels. Make sure heading levels are clearly indicated in the manuscript text.

Layout and spacing

Manuscript text should be double-spaced. Do not format text in multiple columns.

Page and line numbers

Include page numbers and line numbers in the manuscript file. Use continuous line numbers (do not restart the numbering on each page).

Footnotes

Footnotes are not permitted. If your manuscript contains footnotes, move the information into the main text or the reference list, depending on the content.

Language

Manuscripts must be submitted in English.

You may submit translations of the manuscript or abstract as supporting information. Read the supporting information guidelines.

Abbreviations

Define abbreviations upon first appearance in the text.

Do not use non-standard abbreviations unless they appear at least three times in the text. Keep abbreviations to a minimum.

Reference style

PLOS uses “Vancouver” style, as outlined in the ICMJE sample references. See reference formatting examples and additional instructions below.

Manuscript Organization

Manuscripts should be organized as follows. Instructions for each element appear below the list.

Beginning section

The following elements are required, in order:

Title page: List title, authors, and affiliations as first page of manuscript
Abstract

Introduction

Middle section

The following elements can be renamed as needed and presented in any order:

Materials and Methods

Results

Discussion

Conclusions (optional)

Ending section

The following elements are required, in order:

Acknowledgments

References

Supporting information captions (if applicable)

Other elements

Figure captions are inserted immediately after the first paragraph in which the figure is cited. Figure files are uploaded separately.

Tables are inserted immediately after the first paragraph in which they are cited. Supporting information files are uploaded separately.

Data

PLOS journals require authors to make all data underlying the findings described in their manuscript fully available without restriction, with rare exception.

Large data sets, including raw data, may be deposited in an appropriate public repository. See our list of recommended repositories. For smaller data sets and certain data types, authors may provide their data within supporting information files accompanying the manuscript. Authors should take care to maximize the accessibility and reusability of the data by selecting a file format from which data can be efficiently extracted (for example, spreadsheets or flat files should be provided rather than PDFs when providing tabulated data).

For more information on how best to provide data, read our policy on data availability. PLOS does not accept references to “data not shown.”

To include a link to a protocol in your article:

Describe your step-by-step protocol on protocols.io.

Select Get DOI to issue your protocol a persistent digital object identifier (DOI)

Include the DOI link in the Methods section of your manuscript using the following format provided by protocols.io: <http://dx.doi.org/10.17504/protocols.io>. [PROTOCOL DOI]

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Results, Discussion, Conclusions

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